INFINITE RICHES IN A LITTLE ROOM.
—*Christopher Marlowe.*

NEW AMERICANIZED
ENCYCLOPÆDIA BRITANNICA

REVISED AND AMENDED.

A DICTIONARY OF ARTS, SCIENCES AND LITERATURE

TO WHICH IS ADDED

BIOGRAPHIES OF LIVING SUBJECTS

96 Colored Maps and Numerous Illustrations.

EDITED BY
W. H. DEPUY, D.D., LL.D.
And a Corps of Eminent Writers.

VOL. X.—SAN—THI.

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LIST OF MAPS

VOLUME X.

PAGE

South Carolina 5495

Spain and Portugal 5499

Sweden and Norway 5646

Tennessee 5748

Texas 5762

BIOGRAPHIES.

In Volume XII. will be found biographical sketches of the following persons, not treated of in this volume, and not to be found in the English edition:

Sankey, Ira David.
Sant, James, R.A.
Santley, Charles.
Sarasate, Martin M.
Sarcey, Francesque.
Sardou, Victorien.
Sargent, Aaron Augustus.
Sargent, Charles Sprague.
Sargent, Epes.
Sarmiento, Domingo.
Sartain, John.
Satolli, Cardinal.
Saxe, John Godfrey.
Saxe-Weimar, Prince of.
Say, Jean Baptiste.
Say, Thomas.
Sayce, Archibald Henry, D.D.
Scannell, Richard.
Scarborough, John.
Schaff, Philip, D.D., LL.D.
Scharf, George, F.S.A.
Schenck, Robert C., Gen.
Scherer, Edmond.
Scherzer, Carl von.
Schilling, Johann.
Schley, Winfield Scott.
Schliemann, Heinrich, F.S.A.
Schmidt, Ernst, M.D.
Schmidt, Heinrich J.
Schmitz, Leonhard, LL.D.
Schneider, Hortense.
Schnitzler, Eduard (Emin Pasha).
Schofield, John McA., Gen.
Scholten, Johannes.
Schott, Wilhelm.
Schreiner, Olive.
Schumann, Clara.
Schurz, Carl.
Schuvaloff, Count.
Schuvaloff, Count P.
Schuyler, Eugene.
Schuyler, Peter.
Schuyler, Philip John.
Schwann, Theodore.
Schwartz, Wilhelm.
Schwarzenberg, Frederick, Cardinal.
Schwatka, Frederick.
Schweinfurth, George August.
Schweinitz, Edmund A.
Sclater, Philip, M.A.
Sclater-Booth, George, M.P.
Scott, Benjamin.
Scott, Charles B., D.D.
Scott, Clement.
Scott, Dred.
Scott, Julian.
Scott, Robert, D.D.
Scott, Robert Henry, F.R.S.
Scott, Thomas A.
Scott-Siddons, Mary F.
Scrivener, Frederick, LL.D.
Scudder, Samuel H.
Seabury, Samuel, Bishop.
Searing, Laura R.
Searle, Arthur.
Searle, George Mary.
Secchi, Petro, Cardinal.
Seddon, James A.
Seddon, John P.
Sedgwick, Amy.
Sedgwick, Catherine Maria.
Sedgwick, John.
Sedgwick, Theodore.
Seeley, John Robert, M.A.
Seelye, Julius Hawley.
Seelye, Laurens Clark.
Seeman, Berthold.
Seguin, Edouard.

Selborne, Earl of.
Sellar, Alexander C.
Sellar, William Y., LL.D.
Selous, Frederick C.
Selwyn, John, Bishop.
Sembrich, Marcella.
Semmes, Raphael, Capt.
Senior, William.
Sergeant, John.
Serpa Pinto. See Pinto.
Serrano, Francisco.
Server, Pasha.
Sevier, John.
Sewell, Elizabeth.
Seymour, George F.
Seymour, Horatio.
Shaler, Nathaniel S.
Sharpless, James.
Sharswood, George.
Shattuck, Aaron D.
Shaw, Eyre M.
Shaw, Henry.
Shaw, Henry W.
Shaw, Lemuel.
Shawbena, Chief.
Shays, Daniel.
Shea, John D.G.
Shedd, William G. T., LL.D.
Shelby, Isaac.
Shepard, Charles Upham.
Shepard, Elliott F.
Shepstone, Sir Theophilus.
Sherbrooke, Viscount.
Sheridan, Philip Henry, Gen.
Sherman, John.
Sherman, Roger.
Sherman, Thomas W.
Sherman, William T., Gen.
Shields, James. Gen.
Shillaber, Benjamin P.
Shippley, Orby, M.A.
Shippen, Edward.
Shiras, George.
Shirlaw, Walter.
Shirley, William, Gov.
Shore, Thomas T., M.A.
Short, Charles.
Shorthouse, John Henry.
Shufeldt, Robert Wilson.
Sibley, Henry.
Sibley, Henry H.
Sickles, Daniel E., Gen.
Sidgwick, Henry, M.A.
Siegert, Karl August.
Sigel, Franz, Gen.
Sigourney, Lydia H.
Sikes, Sir Charles.
Sill, Joshua W.
Simcoe, John Graves.
Simeoni, Giovanni, Cardinal.
Simmons, Franklin.
Simmons, Sir John.
Simmons, William Henry.
Simms, William Gilmore.
Simon, John, F.R.S.
Simon, Jules.
Simonin, Louis L.
Simpson, Edmund.
Simpson, Edward.
Simpson, John Palgrave.
Simpson, Matthew, Bishop.
Simpson, William, F.R.S.
Sims, Charles N.
Sims, George Robert.
Sims, James Marion.
Sims, Richard.
Sims, Winfield Scott.
Simson, Martin Edward.
Sitting Bull, Chief.
Skeat, Walter William.
Skelton, John, LL.D.
Skene, Philip.
Skene, William F., D.C.L.
Skinner, Richard.
Skobeleff, Michael, Gen.
Slemmer, Adam J.
Slidell, John.
Sloan, Samuel.
Slocum, Henry W.
Sloper, E. H. L.
Smalley, Eugene V.
Smalley, George W.
Smiles, Samuel, LL.D.
Smillie, George H.
Smillie, James.
Smith, Andrew J.
Smith, Benjamin B.
Smith, Benjamin L.
Smith, Charles R., F.S.A.
Smith, Caleb B.
Smith, Charles E.
Smith, Charles F.
Smith, Charles R.
Smith, Daniel B.
Smith, Edmund Kirby, Gen.
Smith, Francis H.
Smith, George.
Smith, George B.

Smith, George Vance.
Smith, George W.
Smith, Gerrit.
Smith, Goldwin, LL.D.
Smith, Green Clay.
Smith, Gustavus W.
Smith, Hoke.
Smith, James.
Smith, John Lawrence.
Smith, Jonathan B.
Smith, Joseph.
Smith, Joshua H.
Smith, Melancton, Admiral.
Smith, Richard.
Smith, Robert A., F.R.S.
Smith, Robert Payne, D.D.
Smith, Seba.
Smith, Sir Albert.
Smith, Sir David.
Smith, Sir Donald A.
Smith, Thomas.
Smith, Thomas K.
Smith, William.
Smith, Sir William, LL.D.
Smith, William Henry, M.P.
Smith, William Robertson, LL.D.
Smithson, James.
Smybert, John.
Smyth, Egbert Coffin.
Smyth, Newman.
Smyth, Piazzi.
Snelling, Josiah.
Sorby, Henry C., LL.D.
Sothern, Edward A.
Soulé, Pierre.
Soulouque, Emperor.
Sower, Christopher.
Spalding, John Franklin.
Spalding, John L., Bishop.
Sparks, Jared.
Speed, James.
Spence, Donald, M.A.
Spencer, Earl.
Spencer, Herbert.
Spencer, John C.
Spielhagen, Friedrich.
Spinner, Francis E.
Spinola, Francis B., Gen.
Spofford, Harriet P.
Spofford, Henry M.
Spotswood, Alexander.
Sprague, Charles.
Springer, William M.
Spüller, Eugène.
Spurgeon, Charles H., Rev.
Squier, Ephraim G.
Stainer, John, Mus. Doc.
Stanbery, Henry.
Stanbuloff, Stephen.
Standish, Miles.
Stanford, Charles V.
Stanford, Leland.
Stanhope, Edward.
Stanley, Henry M.
Stanley of Preston, Lord.
Stansfeld, James, M.P.
Stanwix, John, Gen.
Stapleton, Augustus G.
Stark, John.
Starkey, Thomas Alfred.
Starkwether, John C.
Stead, William T.
Stedman, Edmund C.
Steedman, James B.
Steele, Frederick.
Steele, Sir John, R.S.A.
Steinetz, W.
Stemmetz, Carl F., von.
Stephen, Sir Alfred.
Stephen, Sir James.
Stephen, Leslie, M.A.
Stephens, Ann Sophia.
Steuben, Baron von.
Stevens, Edwin A.
Stevens, Isaac Ingalls.
Stevens, John.
Stevens, Thomas H.
Stevenson, Adlai E.
Stevenson, Andrew.
Stevenson, Robert Louis.
Stevenson, Thomas G.
Stewart, Alexander T.
Stewart, Balfour, F.R.S.
Stewart, Charles, Admiral.
Stewart, Sir Donald.
Stewart, Sir Robert.
Stewart, Thomas Grainger.
Stigand, William.
Stiles, Ezra.
Stillé, Alfred.
Stillé, Charles J.
Stilliman, William J.
Stimpson, William.
Stirling, James H., LL.D.
Stirling, Mrs.
Stirling, Sir Thomas.
Stocks, Lumb, R.A.
Stockton, Francis R.

Stockton, Richard.
Stockton, Robert F.
Stoddard, Charles W.
Stoddard, Richard H.
Stokes, George G., F.R.S.
Stokes, Sir John.
Stokes, William.
Stone, Charles P.
Stone, Edward J., F.R.S.
Stone, Lucy.
Stone, Marcus, R.A.
Stone, Thomas.
Stone, Warren.
Stoneman, George.
Storey, George, A., A.R.A.
Storey, Wilbur F.
Storrs,, Emory A.
Storrs, Richard S., D.D.
Story, Robert H.
Story, William W.
Stoughton, John, D.D.
Stoughton, William.
Stowe, Calvin E.
Stowe, Harriet B.
Strafford, Earl of.
Stratton, Charles C.
Strauss, Johann.
Street, Alfred B.
Stringham, Silas H.
Strong, James.
Strong, James H.
Strossmayer, Joseph, Bishop.
Strother, David H.
Stuart, Alexander H. H.
Stuart, James, M. P.
Stuart, James E. B., Gen.
Stubbs, William, D.D.
Sturgis, Samuel D.
Stuyvesant, Peter.
Sucre, Antonio de.
Sullivan, Sir Arthur.
Sullivan, Barry.
Sullivan, Edward.
Sullivan, John.
Sully, James, M.A.
Sully, Thomas.
Sully–Prudhomme, René.
Sumner, Edwin V.
Sumner, William G.
Sumter, Thomas.
Sutro, Adolph H.
Sutter, John A.
Swayne, Noah H.
Sweatman, Arthur, Bishop.
Sweeny, John.
Sweeny, Thomas W.
Swift, Lewis, Prof.
Swinburne, Algernon C.
Swing, David, D.D.
Sword, James B.
Sybel, Heinrich von.
Sykes, George.
Sylvester, James J., F.R.S.
Symington, Andrew J.
Symmes, John C., Gen.
Symonds, John A.

Taaffe, Count.
Tache, Alexander A.
Tache, Sir Étienne.
Taft, Alphonso.
Taglioni, Marie.
Taine, Hippolyte A.
Tait, Arthur F.
Tait, John R.
Tait, Peter G., M.A.
Tait, P. M., F.R.G.S.
Talbot, Edward S., M.A.
Talbot, Ethelbert.
Talbot, Joseph C.
Talbot, Silas.
Talbot, Thomas.
Talbot, W. Q. F.
Talcott, John.
Tallmadge, James, LL.D.
Talmadge, B.
Talmage, Thomas De W.
Talon, Chief.
Talon, Jean B.
Tamberlik, Henri.
Tammany, Chief.
Taney, Roger B., Chief-Justice.
Tann, Van der, Gen.
Tappan, Arthur.
Tappan, Benjamin.
Tappan, Henry P.
Tarleton, Sir B.
Taschereau, E. A.
Tattnall, Josiah.
Tauchnitz, Baron B.
Tayler, Frederick.
Taylor, Alexander S.
Taylor, Alfred.
Taylor, Archibald, A.
Taylor, Benjamin F.
Taylor, Charles, D.D.
Taylor, George.
Taylor, Isaac, LL. D.

Taylor, Isaac E.
Taylor, James M.
Taylor, John.
Taylor, John W.
Taylor, Richard.
Taylor, Sir Richard, Gen.
Taylor, William.
Taylor, William McK.
Taylor, William R.
Tazewell, Littleton W.
Tchernaieff, M. G., Gen.
Teck, Prince of.
Tecumseh, Chief.
Tefft, Benjamin F.
Tegetmeier, William B., F.Z.S.
Temple, Frederick, D.D.
Temple, Sir Richard.
Temple, William G., Admiral.
Tenney, Sanborn.
Tenniel, John.
Tennyson, Lord.
Terhune, Mary Virginia.
Terry, Alfred H., Gen.
Terry, Edward O'C.
Terry, Miss Ellen.
Tesla, Nikola.
Tewfik Pasha.
Thackeray, Annie.
Thatcher, Henry K., Admiral.
Thaxter, Celia.
Thayer, Abbott F.
Thayer, John M.
Thayer, Sylvanus, LL.D.
Thebaw, King.
Theed, William.
Thibaudin, Jean, Gen.

NEW AMERICANIZED
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VOLUME X.

SAN

SAN FRANCISCO, the eighth largest city of the United States, is situated in 37° 47′ 22.55″ N. latitude and 122° 25′40. 76″W. longitude, on the end of a peninsula which has the Pacific Ocean on one side and the bay of San Francisco on the other.

It is the largest city of California and of the Pacific coast, both in population and commercially.

The tongue of land on which the city is situated is about twenty-six miles long and six and a half miles wide. The city is built on hills which at the time of its settlement were almost inaccessible. The hills (Russian Hill, 360 feet; Telegraph Hill, 294 feet; and a number of others, ranging from 75 to 120 feet) were barren and precipitous. Between and beyond them were miles of shifting sand dunes. Only to the eastward was there any apparent site even for a good sized village. There was a cove extending to the present line of Montgomery street, into which the vessels that brought the Argonauts sailed. This has all been filled in, and where the sea-going ships used to anchor is now the wholesale business section of the city.

It was supposed by the early settlers that the metropolis of the State would be at Benicia, thirty miles north, on the Straits of Carquinez; but now Benicia is simply a small suburb, while San Francisco contains 298,997 people.

The bay of San Francisco is reached from the ocean through the Golden Gate, a strait about five miles long and averaging one mile in width, with a depth of thirty feet on the bar at the entrance and from 60 to 100 feet within. The bay, which extends past the city in a south-southeast direction for about forty miles, is about seven miles wide in front of the city, while its greatest width is twelve. Connected with the bay of San Francisco on the north by a strait three miles wide is San Pablo Bay, about ten miles in length and the same in breadth, having at its extreme northerly end Mare Island, the site of the navy yard. This bay, again, is connected by the Straits of Carquinez with Suisun Bay, eight miles long and four wide. The total length of these bays and connecting straits is sixty-five miles. This great inland water, sheltered, and for the most part navigable by the largest craft, receives the two great navigable rivers of California, the Sacramento and the San Joaquin. This gives the city water communication with the interior of the State.

In the bay of San Francisco are Alcatraz Island (30 acres), Angel Island (800 acres), and Yerba Buena or Goat Island (300 acres). Alcatraz and Angel Island are fortified. There are also fortifications along the high bluffs that command the entrance to the harbor.

The presidio, or military reservation, lies north of the city. This was the point of the first settlement of San Francisco. The Spaniards founded a post there on September 17, 1776. The mission San Francisco de los Dolores was established a month later. Beechy, who visited the presidio in 1826, gives the following description of the post:

"The governor's abode was in a corner of the presidio, and formed one end of a row of which the other was occupied by a chapel; the opposite side was broken down, and little better than a heap of rubbish and bones, on which jackals, dogs, and vultures were constantly preying. The other two sides of the quadrangle contained stone houses, artificer's shops, and the jail, all built in the humblest style with badly burned bricks and roofed with tiles. The chapel and the government house were distinguished by being whitewashed."

In 1830 there were fifty Spanish officers and soldiers at the presidio. This number, added to the converts, priests and settlers at the mission Dolores, made a total population of 200.

The presidio inclosure was about 300 yards square. In 1834, when it was secularized and began to be known by the secular name of Yerba Buena, the mission Dolores had a population of 500. In the summer of 1846 an American man-of-war took possession of the place. In the early part of 1849 the inhabitants numbered about 2,000, and the embryo city had already come to be known by its future name of San Francisco. The discovery of gold in California brought thousands to the city, and, at the end of 1849, the city contained ten times as many people as at the beginning of the year.

The first legislature of California granted a charter to San Francisco on May 1, 1850. Prior to that date the government of the pueblo had been administered by an alcalde. The pueblo grant originally made by the king of Spain, contained four square (Spanish) leagues of land; this grant was subsequently confirmed to San Francisco by an act of congress. The jurisdiction of the municipality extends over the islands in the bay. The area included in the limits of the city exceeds the original four square leagues considerably, including what were originally denominated "swamp and overflowed lands" (see Dwinelle's *Colonial History*).

The buildings of San Francisco up to 1850 were nearly all of wood, the frames and coverings of many of which had been brought from the Eastern States around Cape Horn in sailing vessels. There were two or three buildings of granite, the stone for which was quarried and dressed in China and brought over in ships, with Chinese workmen to build the houses. Such a city naturally suffered greatly from fires.

The fire of May 4, 1850, destroyed property to the value of about $3,000,000; another, in the following month, was still more destructive ($4,000,000); and the damage resulting from a third, in September, was estimated at $500,000.

These occurrences naturally led to the building of more substantial structures. More granite was brought from China, brickyards were started, and iron was used largely in the construction of buildings. Since 1850 there has been comparatively little loss by fire, the use of redwood instead of the more resinous pine conducing greatly to this result.

The natural elevations and depressions of San Francisco were not taken into consideration in laying out the streets. The blocks are, for the most part, rectangular, except along Market street, the principal business thoroughfare, which cuts diagonally through three miles of the city. Market street in 1890 extends from the ferry landings to the western hills, but is to be extended through these to the ocean. It is paved with basalt blocks, as are most of the other important streets, though asphaltum and bituminous rock are also used.

Among the public buildings and institutions of San Francisco are the mint, appraisers' stores, subtreasury, custom-house, merchants' exchange, stock-exchange, city-hall, industrial school, house of correction, almshouse, Masonic temple, Oddfellows' building, academy of sciences, safe deposit, and nine theaters and opera-houses.

There are many large hotels, the largest of which, the Palace Hotel, cost $3,250,000, and can accommodate 1,200 guests. The city has eleven public squares. Its greatest attraction is the Golden Gate Park of 1,050 acres, three miles long and half a mile wide, having the ocean for its extreme westerly boundary. The site of this park was originally barren sand dunes, now the greater part of it is covered with trees and lawns, and through it extends splendid walks and driveways. An extensive glass house in a central position is filled with the rarest shrubs and flowers. There is a children's pavilion and play grounds, established by a fund that William Sharon bequeathed by his will when he died. There are deer parks and the nucleus of a zoölogical garden. Just outside the Golden Gate are the seal rocks. These rocks are usually covered with myriads of seals and sea lions. No one is allowed to shoot or capture these animals, and the seal rocks have become one of the great attractions of San Francisco.

Wire cable roads extend over all the high hills on which the city is built. Nearly all the horse railroads in the city have been changed to cable roads. Many of these run up and down grades of 100 feet to the mile. There are forty-one miles of cable roads, representing an expenditure of over $4,000,000. The speed of the cable cars is from four to eight miles an hour. San Francisco is the terminus of two continental railways, viz., the Union and Central Pacific, and the Southern Pacific; while a third, the Atlantic and Pacific, enters the city over a leased line from Mojave. Two narrow-gauge lines and one broad-gauge to important points in the State are connected with the city by means of ferries.

The population of San Francisco, as shown by the census returns, was 34,000 in 1850; in 1860, 56,802; in 1870, 149,473; and in 1880, 233,959 (132,608 males, 101,351 females). According to the figures given by the United States census the population in 1890 was 298,997.

There is a very large foreign population in San Francisco, and this contributes very largely to its liberal and cosmopolitan character. There are about 30,000 Chinese and their quarter is one of the most picturesque of the sights of the city by the Golden Gate. They have simply transformed this part of San Francisco into a Chinese city. The joss houses, theaters, and restaurants are all duplicates of similar establishments in Pekin or Canton. Few Caucasians are to be seen on the streets of this quarter. A visit to Chinatown is made by most visitors to San Francisco.

In July, 1856, the city and county, which until then had maintained separate governments, were consolidated in one organization. The government is administered by a mayor and a board of twelve supervisors, with the usual officers common to municipal and county organizations. There are also a superior court having twelve departments, with one judge for each, a police court, and justices' courts. The supreme court of the State holds a number of terms each year in San Francisco. The United States district and circuit courts also hold regular terms in the city. There is a well-organized fire department and an efficient police force of 400 men.

The city is supplied with gas by two companies. Water is supplied by the Spring Valley Company, principally from San Mateo county. The water is brought in three lines of wrought-iron pipe; the largest, which connects the Crystal Springs reservoir with the city, is forty-four inches in diameter, and twenty-three miles in length. The daily consumption of water is about 18,000,000 gallons. The company is able to supply 25,000,000 gallons daily, and so extensive is the reservoir system that the city supply could be continued for three years with the water on hand.

Finance.—The assessment roll of personal property in 1890 showed a value of $66,243,938. The aggregate of real estate and improvements was $235,278,013. The real value is not less than $400,000,000. The debt of the municipality is $1,800,000. The rate of taxation is less than that of any large city in the country, the city officers being pledged to keep it within $1 on every $100 of valuation. There are fifteen incorporated commercial or discount banks, with an aggregate paid up capital of $37,000,000. Three private banks add $1,260,000 to this amount. The annual transactions of these sixteen institutions as represented by the clearing house statements are nearly $844,000,000 making this city one of the most important commercia centers of the world. There are twelve savings banks, with a total of deposits, in round numbers, of $87,000,000.

Commerce.—The exports by water for the year 1889 amounted to $61,616,776, and the imports to $58,846,449. The amount of customs duties collected on foreign imports was $9,406,464. The treasure shipped amounted to $20,265,857. The exports of quicksilver were 5,189 flasks, worth $231,000. The value of wheat and flour exports was $21,395,783. Six hundred and seventy-eight sailing vessels and 304 steamers arrived at San Francisco in 1889. The total arrivals, steam and sail, were 982, with an aggregate tonnage of 1,160,332. Six hundred and twenty-five sailing vessels and 289 steamers departed. The total tonnage that left the port amounted to 1,102,303. One hundred and thirty-nine thousand three hundred and fifty tons of freight went east on the overland lines from San Francisco. The coinage of the San Francisco mint during 1889 amounted to $20,495,267. Among the imports were 592,711,959 feet of lumber. Among the exports were $616,999 worth of canned fruit, $2,636,361 worth of salmon, and $3,319,723 worth of wine. There are regular steamship lines connecting San Francisco with Mexican, Central American, Australian, Hawaiian, Japanese, and Chinese ports, and with the chief port of British Columbia. The Pacific Whaling Company owns five or six ships, principally steamers, employed in the Arctic whale fishery. The same company has also extensive works for refining the oil in San Francisco. There is one stone dry dock admitting vessels of 6,000 tons, and two or more floating docks which can take on vessels from 500 to 800 tons burden. A sea-wall is in process of construction by State authority round the deep-water front to prevent the shoaling of the water in the slips resulting in part from the gradual washing down of debris from the hills and steep slopes of the city.

Manufactures.—It is only within the last twenty years that San Francisco has been a manufacturing center. In 1875 there were 18,000 people employed in manufacturing establishments, and the value produced amounted to $40,000,000. In 1890 there were 1,365 manufacturing establishments, employing 37,514 hands, and producing annually $108,763,000 worth of products. The following are some of the leading manufactures, the number of persons employed and the value of their productions: Bags, 140, $625,000; boots and shoes, white 1,600, Chinese 1,400, $4,500,000; cigar-boxes, 325, $260,000; wooden boxes, 420, $1,010,000; brass foundries, 300, $450,000; beer, 730, $3,987,500; cigars, 3,500, $4,155,000; clothing, 2,750, $6,250,000; coffee and spices, 164, $2,100,000; cordage and ropes, 200, $650,000; crackers, 265, $1,000,000; dry docks (stone), 8, $675,500; flour, 400, $3,750,000; foundries, 4,000, $5,550,000; furs, 150, $320,000; furniture, 940, $1,500,000; gas works, 620, $12,000,000; harness, 500, $1,250,000; jewelry, 150, $950,000; linseed oil, 60, $895,000; pickles and fruits, 900, $3,000,000; provision packing, 240, $1,300,000; rolling mills, 825, $1,325,000; sashes, doors, etc., 1,400, $4,500,000; ship-yards, 250, $1,750,000; shirts, 2,550, $990,000; soap, 240, $2,800,000; sugar refineries, 800, $20,000,000; tanneries, 755, $2,500,000; tinware, 2,000, $4,500,000; woolen mills, 5,000, $350,000. The laundries employ: white, 1,025; Chinese, 2,500.

Churches and Charities.—There are 73 Protestant churches in the city, representing nearly all the denominations of the country. Besides these there are 21 Roman Catholic churches and a number of chapels connected with the various hospitals and schools. There are 8 synagogues, and 1 Greek Church (Russian). Including chapels, the total number of places of worship may be set down at 110. Of late years many of the churches which had been plain wooden structures have been rebuilt in brick and stone. Among the most imposing church buildings are the new Catholic cathedral, the Temple Emmanuel, the Lutheran church, and the Starr King.

The asylums and benevolent associations are numerous and well supported. The more prominent of these institutions are the Protestant Orphan Asylum (214 children), Catholic Orphan Asylum, Pacific Hebrew Orphan Asylum, Magdalen Asylum, Old People's Home, Ladies' Protection and Relief Society, Little Sisters' Infant Shelter, Seamen's Friends' Society, San Francisco Benevolent Society, Ladies' United Hebrew Benevolent Society, San Francisco Fruit and Flower Mission, Young Men's Christian Association, Pacific Homeopathic Dispensary, Lying-in Hospital. Besides these there are a great number of associations which care for their members, and in some instances provide the best medical attendance in private hospitals. Nearly all classes of foreign nativity have established benevolent associations; British, French, and German institutions have large resources, and are managed with great efficiency. Nearly all the secret orders (Masonic, Oddfellows, etc.), devoted in whole or in part to works of benevolence, are strongly represented. Societies for the suppression of vice, and for the prevention of cruelty to children and animals, also exist here.

Public Schools.—The first public school was established in April, 1849. There are now seventy-one free schools, with 42,626 pupils and an average daily attendance of 31,609. The number of children in the city between the ages of five and seventeen years, according to the census report of 1890, was 60,642. The number of teachers, male and female, employed in the public school department was 838, the number of school-houses seventy-four, and the expenditure for the fiscal year $916,643.73. The public schools are graded, the highest grades being two high schools for boys and girls respectively. Besides the day schools a number of evening schools are provided. There are upward of 25,000 children who are to a large extent provided with instruction in public and private schools other than those belonging to the free-school department. There are about 100 schools in the city, of all grades, which are supported wholly by fees and voluntary contributions. Of these the Roman Catholics have the greatest number, the latter including two colleges and a number of convent schools. The Protestant denominations also have a number of classical and secondary schools of great excellence. The public-school system of the State culminates in the university of California, which has an aggregate endowment equal to about $3,000,000. The institution is situated in the beautiful suburban town of Berkeley, on the opposite side of the bay (named in honor of Bishop Berkeley). Instruction is furnished free to all pupils who comply with the terms of admission. There are also a number of professional schools in the city, chief among which are the law, medical, and dental departments of the university, the Cooper Medical College, the Hahnemann Medical College, the San Francisco Theological Seminary, and an art school with an average attendance of about seventy-five students. The late James Lick left a bequest of $540,000 for the endowment of a School of Mechanic Arts, and among other bequests a large one for the Academy of Sciences, founded in the early period of the city. The public-school department of San Francisco is under the immediate supervision of a superintendent and twelve school directors, one for each ward of the city. There are eighteen public libraries, including the free library with 56,719 volumes.

The Mercantile Library Association has 55,000 volumes, the Mechanics' Institute 40,000, the Oddfellows' Library Association 39,000, and the Law Library 28,582.

The history of San Francisco reads like a fairy tale. In the early days the city was subject to many and great changes of fortune. As before stated, when the country was taken into possession by the United States, the town was but an insignificant village, but began slowly to grow. The discovery of gold in 1849 at first caused the place to be almost deserted, but by and by the necessity of some common emporium, where the miners could meet to procure the necessaries of life and the implements for prosecuting their search for gold, caused the establishment of some trade, and very soon after came those wonderful scenes of quickly acquired wealth, of wild hilarity, of uproarious revelry, the description of which in these days seems to those who know the city as it now is, the wildest exaggeration. Men of all nationalities and all grades of social life flocked to the new city where gold was the article of commonest traffic, and where in a few months they might become possessed of more wealth than years of toil in other communities would give them. The city at this time was the paradise of the gamester. Where, to-day, the life and property of every citizen are as secure as anywhere else on earth, then the pistol or the knife was the only arbiter of disputes between man and man, and might made right with a vast number of the adventurers flocking thither. But there was good material among those rough, brawny pioneers, and the results of their labors to-day need not make them ashamed. The city which they built, not yet past its semi-centennial, is one of the handsomest in America, and will compare favorably with any other city of its size anywhere on the globe. Its material prosperity is assured, for it is based on a solid foundation. Those conservators of the town in its older days wrought well. The hardships they endured and the battles they fought with dangers seen and unseen, have borne good fruit. Men yet live who remember when the magnificent city of to-day was a mere hamlet composed of temporary "shanties" among which the "doggeries" and the gambling booths bore a prominent part; and men yet live and are not aged who helped change all this, and in its stead to rear the city as we now have it, the pride of its people and the emporium of the coast.

SANGALLO, the surname of a Florentine family, several members of which became distinguished in the fine arts. I. Giuliano di Sangallo was a distinguished Florentine architect, sculptor, tarsiatore, and military engineer, born in 1443. His father, Francesco di Paola Giamberti, was also an able architect, much employed by Cosimo de' Medici. During the early part of his life Giuliano worked chiefly for Lorenzo the Magnificent, for whom he built a fine palace at Poggio-a-Cajano, between Florence and Pistoia, and strengthened the fortifications of Florence, Castellana, and other places. He died in 1517.

II. Antonio di Sangallo was the younger brother of Giuliano, and took from him the name of Sangallo. To a great extent he worked in partnership with his brother, but he also executed a number of independent works. As a military engineer he was as skillful as Giuliano, and carried out important works of walling and building fortresses at Arezzo, Montefiascone, Florence, and Rome. His finest existing work as an architect is the church of S. Biagio at Montepulciano. He was born in 1448 and died in 1534.

III. Francesco di Sangallo, born 1493, the son of Giuliano di Sangallo, was a pupil of Andrea Sansovino, and worked chiefly as a sculptor. His works have for the most part but little merit—the finest being his noble effigy of Bishop Leonardo Bonafede, which lies on the pavement of the church of the Certosa, near Florence. His death occurred during the year 1570.

IV. Bastiano di Sangallo, born 1481, Florentine sculptor and painter, was a nephew of Giuliano and Antonio. He died in 1551.

V. Antonio di Sangallo, the younger, another nephew of Giuliano, went while very young to Rome, and became a pupil of Bramante, of whose style he was afterward a close follower. He died in 1546.

SANGERHAUSEN, an ancient town of Prussian Saxony, is situated on the Gonna, near the south base of the Harz Mountains, and thirty miles to the west of Halle. In 1880 it contained 9,136 inhabitants, chiefly occupied in the manufacture of beetroot sugar, machinery, buttons, etc., in agriculture, and in the coal and copper mines of the neighborhood. The present (1890) population is 10,100.

SANGIR ISLANDS lie in the north of Celebes, in 2° 4′ N. latitude, are upward of fifty in number, of various sizes, and nearly all inhabited. Population, 80,000. The three largest islands, Great Sangir, Sjiauw, and Tagolandang, with those which surround each, form, as it were, groups. In the Sangir Islands are many mountains, which, except the volcanoes, are clothed to their summits with a rich vegetation. Great Sangir has an area of 273 square miles, and is divided into four kingdoms. The usual anchorage is on the west side, in 3° 28′ N. latitude, and 125° 44′ E. longitude. Population, 13,000. In the northwest is a volcano called Abu, or the "Ash Mountain," which has frequently caused great devastation.

SANHEDRIN. See Synedrium.

SANITARY SCIENCE has of late years attracted much attention, particularly in the United States, where the study has kept pace with social and political economics. The science may be briefly defined as that branch of biology which teaches man the correct mode of life, to the end that his health may be best preserved and his functions best discharged and physical mission in life fulfilled.

The ultimate end and object of the two sexes is to procreate and perpetuate their species, and in order that this may be best done it becomes necessary that the conditions surrounding individuals shall be such as will maintain them in conditions of highest physical vigor, or that will, when they are temporarily disabled by accident or disease, restore them to their normal state of health. It is the mission of sanitary science to bring about this state of affairs.

Sanitary science deals with the food supply of man as well as with the external conditions which surround him—such as proper clothing, habitation, etc.

Taking the first item of this category, we will enunciate a few principles which will be found conducive to health. In the first place, food should be fresh, and, as far as possible, fortified against infection from the almost innumerable sources of fermentation and decay. This being assured, the next consideration is that such food as requires dressing by fire should be well cooked. All meats should be subjected to a degree of heat at least sufficient to kill any bacteria or animalculæ which may infest it. Vegetables should be well cooked, or, if eaten raw, should be thoroughly mature and fresh. The diet should be a mixed one, vegetables, fruits, and the cereals preponderating. Very little meat should be eaten by persons of sedentary habits, and the occasional use of fish is desirable. The staple food, however, should be fruits and vegetables. These keep the bowels well relaxed, cleanse the stomach, and cool the blood. Of course, in the case of the hard-laboring man, more meat must be consumed. The great danger arising from excessive use of meat is that it may sometimes leave a refuse in the system, which is not eliminated, and becomes the producing agent of that agonizing affection—rheumatism. We venture to say that a strict vegetarian incurs far less liability to rheumatism under given circumstances than does a meat-eater similarly situated. To sum up, let the food-supply be wholesome, properly cooked, aud judiciously eaten. In the matter of kinds of food, each man's experience will dictate that which affords him best nourishment. The writer, however, would especially call attention to the fact that some of our best authorities denounce the flesh of swine as unfit for food in the temperate or torrid zones—this in the face of the startling array of figures it would take to enumerate its consumers. Meat-eating should be confined to mutton and beef and poultry.

Proper food being secured the next item of importance for the continuance of health is proper clothing. On this head nothing need be said as to quality or cut of garment. The *desiderata* are that they shall be warm enough for the season and climate, and loose enough to allow a perfect freedom of motion and circulation of the blood. No compression of the body, in either male or female, at any point of the anatomy should be tolerated. Perfect comfort is best attained by loose, warm clothing, and in this case, at least, comfort and health are synonymous.

"Cleanliness is next to godliness." So says the old saw—and truly. The excretions of the body are a most important element in the factors that go to make up health or disease. The pores of the skin are the sewers through which such of the waste material as is not carried off through the bowels is eliminated. When the proper precautions are not taken as to bathing, these minute waste-pipes become clogged, and the result is that they do not perform their offices properly, and the waste, instead of being excreted, is retained in the system, poisoning the blood, to the great detriment of the general health. Bathing regularly is indispensable to the general health; but there may be such a thing as carrying it too far. Too much water is not a good thing, as it leaves the subject debilitated by its excessive use. As to the form of bath to be used, this must be entirely regulated by the needs of each subject. It may, in general, be said that hot baths are debilitating and cold stimulating. Yet the exigencies of a particular case may call for one or the other to the exclusion of its opposite. The advice the old man gave to the son about starting on a journey was good. He said, "My son, fear God, love your neighbor, but, above all, wash yourself." This rule of conduct will go far toward banishing disease.

Next in importance comes the question of habitation. A dwelling house, in the first place, must be dry. The next consideration is that it be airy and well lighted. Its sewage connections must be such that no noxious gases can be retained or enter from the outside. The closets must be so arranged that the atmosphere shall not be contaminated by foul smells arising therefrom. The sleeping apartments must be well ventilated, so that a current of fresh air is continually replacing that which has been exhaled and loaded with carbonic acid gas. They should not be kept at a higher degree of temperature than 70° nor lower than 60°. A good plan is to so arrange that the windows in the sleeping rooms may be opened without creating a direct draught upon the sleepers. This may usually be done by raising the sash about six or eight inches from the bottom and then pinning a newspaper across the opening, leaving the bottom and top of the paper loose and only securing the ends. This creates an influx of fresh air, but diverts the direct current so that one portion ascends and the other descends. The sitting rooms, dining rooms, etc., should be kept at a temperature of about 70°, and should also be well ventilated. Stoves are to be condemned, and should be dispensed with if possible. Open fire-places are the best means of heating a house, and next to them stand steam-pipes (*i.e.* where proper ventilation can be secured). It is now pretty well understood that a stove not only distills noxious gases by combustion, but also creates carbonic anhydryde by chemical process, decomposing the atmospheric air and generating carbonic acid gas.

If all these details be properly attended to and the foregoing directions as to diet, clothing, and bathing be followed, there yet remains to be treated of the pertinent subject of existence. Any muscle or organ of the body unused when the fullness of time has arrived for the exercise of its functions will wither, or in technical language will atrophy. In the light of this fact one can readily see how necessary it is for the well-being of a person that all the various muscles of the body should receive an amount of exercise that will keep them in healthy condition. The various kinds of exercise recommended have all of them claims to consideration, and it is also true that no one movement or set of movements can be made to cover the entire ground desirable to cover in the taking of exercise. The athletic sports are mostly directed or controlled by special sets of muscles, and let the exercise be ever so violent, there are other muscles which are not involved at all. Horseback riding probably comes nearer involving all the muscles of the body at once than any other form of exercise. But it is useless to prescribe any one sort of exercise. Let the exercise be comprehensive. Let it cover all the ground possible and include as many varieties as possible. Then, taking this as a starting point, exercise moderately—not excessively; gradually working up to a certain point, and it will be a matter of surprise how soon a hard-muscled athlete will be developed.

One more topic needs be considered in relation to sanitary science as applied to individuals—this is the use of various stimulants and narcotics. The entire code of laws in reference to all of these may be summed up in the one word *Don't!*

Alcoholic stimulants, to say nothing of the moral aspect of the question, are the greatest bane of modern life. Besides, the man who observes the foregoing directions, unless congenitally diseased, will need no stimulants. Alcohol induces hyperæmia, disturbs the nerve centers, upsets the circulation, and destroys the tone of the stomach. Tobacco is, to say the least (in its chewing form), filthy; besides this it robs the subject of saliva that should be used in the digestion of food; when smoked it acts on the brain as a narcotic disturbing the nerves, and, through the nerves the heart, producing palpitation and kindred evils. It also provokes indigestion and aggravates dyspepsia. It is best left alone in any form.

The question of sanitary science as applied to communities, is best treated of under the head PUBLIC HEALTH, and the reader is referred to that article for the discussion of the subject in that aspect.

United States Sanitary Commission.—Long before the commencement of active hostilities in the war between the States, precipitated by the attack upon Sumter, measures were taken by societies and individuals for the care of those who responded to President Lincoln's calls for volunteers. Early in April, 1861, lady residents of Connecticut, Massachusetts, and other eastern States, convened and formulated a plan of action in connection with furnishing such aid and relief to the volunteers as the nature of the case demanded. The precedent thus established was followed by ladies in States adjoining, as also at a distance; and during the latter part of the same month the ladies of New York organized a relief association, which became the nucleus of the sanitary commission. Soon after the election of its officers, the relief association communicated with the authorities at Washington as to the objects contemplated by their organization; and after some correspondence a committee consisting of a number of representative New Yorkers, including among others Doctors Bellows, Harris, Harsen, etc., visited the capital to confer with the president and his advisers, and if possible to procure the appointment of a commission armed with authority that would enable them to render effective services. The conference was not altogether satisfactory. The president, after a prolonged discussion, finally decided to organize the proposed commission, but to limit its authority to visiting the troops, consulting with the medical bureau, and recommending reforms to the war department. Such conditions having been accepted by the committee, the war department, June 1, 1861, issued an order creating the sanitary commission of the United States.

The board of officers was appointed by the war secretary and chief of the Medical Bureau, and consisted of H. W. Bellows, D.D., Prof. A. D. Bache, LL.D., Drs. Jeffries Wyman, W. H. Van Buren, R. C. Wood, U. S. A., S. G. Howe, and Prof. Wolcott Gibbs. The army was represented by A. E. Shiras and G. W. Cullum. Later, the executive officers were elected, H. W. Bellows, of New York, as president, A. D. Bache, of Washington, vice-president, G. T. Strong, of New York, treasurer, and F. L. Olmstead, secretary; Drs. Gibbs, Van Buren, and Agnew constituting the medical committee. The executive board was subsequently increased by the addition of representative men from the leading cities, and the standing committee convened daily in New York during the continuance of the war.

The relief afforded was, first, that furnished on the march, during or after a battle, and to wounded remaining in hospitals when the army resumed its march; second, that afforded the sick of new regiments and to soldiers discharged or dismissed from hospitals. Another branch of the work intrusted to the commission was the preservation of a record of the sick and wounded of the army, so far as the same could be made up from data available for that purpose. Offices were opened at Washington, Philadelphia, and Louisville, during the fall of 1862. Reports from the Eastern armies were sent to Washington and Philadelphia, those from the Western armies to Louisville. These reports contained the names of the wounded carefully gathered after every battle by an agent of the association, and were further supplemented by reports from nearly every hospital in the field. The information thus secured was of a character so reliable, and the inquiries in search of missing soldiers were prosecuted so successfully, that in a vast majority of cases his fate was ascertained beyond any reasonable doubt. Still another duty with which the commission was charged was the inspection of regiments and the tabulation of statistics as to "the effects of applied or neglected hygiene, diet, long marching, heavy equipment, the influence of climate, drill, nationality, previous occupations, education, etc., upon soldiers," and other facts bearing upon "scientific attempts to generalize the causes of our disasters."

The work of the commission on the field and in the hospital, in alleviating suffering and saving life by introducing reforms, weeding out ignorance and incompetency, though attended with some danger to members, saved hundreds of lives that would otherwise have perished. The same may be said of inventions made by members, including the pavilion tent for reducing the dangers of contagion, also hospital cars and steamboats by which the horrors of travel for the wounded were measurably diminished. Depots of supplies were established in the several military departments, also feeding stations and temporary hospitals along the line of march, and neither pains nor expense were spared to promote the health and well-being of the soldier. When battles were anticipated preparations were made for the care of the wounded, the burial of the dead, and the discharge of the many unexpected duties incident thereto. At its conclusion the most valuable services in these and other particulars were rendered.

When the commission was organized there was but a limited amount of money available, and aid was solicited from the public. The responses were slow at first, and much tribulation was experienced. The latter portion of 1862, however, witnessed a change, and money began to arrive in abundance from all directions. Large amounts came from California, South America, and portions of Europe, while the fountains of finance at the East and in the West were touched by the hand of human sympathy, and abundant streams of revenue gushed forth. Supplementary to these, sanitary fairs were held in New York, Philadelphia, Boston, Brooklyn, Albany, Cincinnati, Chicago, and other large cities, with the best results, and the contributions of clothing, food, wine, delicacies, bandages, medicaments, and other articles, filled to repletion the store-houses located at Boston, New York, Philadelphia, Washington, Wheeling, Cincinnati, Columbus, and Chicago. The total amount of money received by the commission from its organization to the surrender of its charter, was more than $6,000,000, and the value of goods was upward of $15,000,000.

The work of the commission is regarded as one of the most perfect exemplifications of practical charity recorded in history. The devotion, sympathy, and fidelity manifested by the association and its members will be remembered as incidents of a struggle that served to dissipate much of the bitterness that struggle gave birth to, as also to bridge the brief interval between friend and foe.

SANITATION. See HYGIENE and SEWAGE.

SAN JOSÉ, the capital of Costa Rica, Central America, stands 3,900 feet above the sea, in a beautiful valley surrounded by mountains, on the west side of the main range about fifteen miles northwest of Cartago (the ancient capital), with which it is connected by a railway. San José is the seat of the national bank (founded in 1873) and of a university, to which a medical school and a museum are attached. The population is estimated at from 20,000 to 25,000.

SAN JOSÉ, the capital of Santa Clara county, Cal., is located on the left bank of the Guadalupe river at a point where that stream leaves the beautiful Santa Clara valley and pursues its way to San Francisco Bay, seven miles further in a southerly direction. The Central and Southern Pacific roads afford rapid communication with San Francisco city, and the Southern Pacific offers equal facilities for reaching the coast. The city is noted for its rapid growth, delightful climate, and charming surroundings, made up of gardens and orchards, evidencing the high degree of culture attainable, as also the care and taste by the exercise of which such luxuriant growth and development is rendered possible. It contains one private bank, two national and three savings banks with a combined capital of $1,500,000, city hall, twelve churches, the State normal school and academy of Notre Dame, the university of the Pacific and State asylum for the chronic insane, also the first electric tower erected in America. The latter is constructed of iron and is 200 feet in height. The court-house is an elaborate and finely arranged building put up at a cost of $200,000, and the business and residence portions of the city are compactly and substantially built. Three daily and three weekly papers are published and the hotels furnish abundant and elegant accommodation for a large number of guests. Iron foundries, machine-shops, tanneries, flour and saw mills, and other branches of manufactures are successfully operated and are annually growing in number and importance. Besides three public parks in the city San José possesses a tract of 400 acres in Penitencia Cañon, seven miles east, reserved for a similar purpose. The Lick Observatory (founded in 1884 on the top of Mount Hamilton) is twenty-six miles distant, and the Almaden quicksilver mines about fourteen miles. The population of the city was 9,089 in 1870, 12,567 in 1880, and 18,060 in 1890.

SAN JUAN BAUTISTA, the capital of Porto Rico *(q. v.)*, one of the Spanish West India Islands, was founded in 1511 by Ponce de Leon. It contains a governor's palace in the old fort of Santa Carolina and a handsome cathedral. The population is 26,000, and the harbor is one of the best in the West Indies.

SAN JUAN DE LA FRONTERA, the capital of a province of the Argentine Republic, is situated 2,310 feet above the sea in a great bend of the Rio de San Juan, ninety-five miles north of Mendoza and 730 miles from Buenos Ayres, with which it was connected by rail in the year 1886. It is mostly built of sun-dried bricks, has a cathedral, several churches and schools, two banks, and a botanical garden, and carries on a considerable trade with Chili by the Patos and Uspallata passes. Population estimated at 20,000 in 1881, and 22,000 in 1890.

SAN JUAN DEL NORTE. See GREYTOWN.

SAN JUAN (or HARO) ISLANDS, an archipelago (San Juan, Orcas, Shaw, Lopez, Blakely, Cypress, etc.) lying between Vancouver Island and the mainland of North America, which were for many years the subject of dispute between the British and the United States Governments, and were finally assigned to the latter country by the arbitration of the emperor of Germany (October 21, 1872). Geographically the cluster certainly belongs to the mainland, from which it is separated by Rosario Channel, generally much under fifty fathoms in depth, while Haro Strait, separating it from Vancouver Island, has depths ranging from 100 to 190 fathoms. In 1873 the islands, formerly considered part of Whatcom county, Washington, were made the separate county of San Juan. Of the total area of 200 square miles, about 60 are in San Juan, 60 in Orcas, and 30 in Lopez. The population was 554 in 1870, 948 in 1880, and estimated at 2,000 in 1890.

See *Papers Relating to the Treaty of Washington*, vol. v., 1872, and the map in Petermann's *Mittheilungen*, 1873.

SANKT JOHANN. See SAARBRÜCKEN.

SANKT PÖLTEN, a small town, and the seat of a bishop in Lower Austria, is situated on the Treisen, a tributary of the Danube, sixty-one miles west of Vienna by rail. The inhabitants, 10,015 in number, carry on some trade, and the manufacture of iron, wire, paper, weapons, etc.

SAN LUCAR DE BARRAMEDA, a town of Spain, in the province of Cadiz, and twenty-seven miles by sea from that city, in a bare, sandy, and undulating country, on the left bank of the Guadalquivir, not far from its mouth. It stands partly on the flat bank of the river and partly on the rising ground behind, the summit of which is crowned by an old Moorish castle. It is now chiefly dependent on the trade in its wines, which is considerable. Many of the inhabitants are employed in agriculture and fishing. The population within the municipal boundaries was 21,918 in 1877, and 32,000 in 1889.

SAN LUIS POTOSI, a city of Mexico, capital of the state of the same name, is situated at a height of 6,200 feet on the eastern edge of the great plain of Anahuac, in a valley running north and south, 160 miles northwest of Queretaro. It is a great center for the "diligence" traffic, and in 1885 connected by rail with Tampico, a promising harbor on the Gulf of Mexico. The city proper, which has a rather imposing Oriental appearance, is laid out with great regularity. Among the conspicuous buildings are the cathedral, the government house, with a front in rose-colored stone, the city-hall, the mint, the churches of El Carmen, San Francisco, etc., and the recently erected "American" hotel, which, with tramways, telephones, and electric light, is a symptom of the Occidentalizing that is rapidly taking place in the inland cities of Mexico. The Instituto Cientifico is a kind of university for the teaching of law, medicine, and the exact sciences. Plaza Hidalgo takes its name from the statue to the martyr of Mexican independence. A considerable trade is carried on in cattle, hides, and tallow. The population is stated at 30,000, or with the suburbs 60,000.

SAN MARINO, the smallest independent republic in Europe, has an area of thirty-three square miles (Strelbitsky), lies between the provinces of Forlì and Pesaro-Urbino, and consists of part of the eastern spurs of the Apennines. Monte Titano, the central and culminating summit, has three peaks (M. Guaita, Cucco, and Gista), the three *Penne* of San Marino—a name evidently identical with the Celtic Penn or Benn, but translated by the canting heraldry of the republic's coat of arms as three "feathers." The two streams (Marecchia and Ausa) which pass through Rimini to the sea have their head-waters partly in the north and west of San Marino, while its southeastern valleys are drained by the sources of the Marano. Farming and stock-raising occupy the bulk of the population (total, 5,700 in 1850, 7,816 in 1874), and their wines and oxen are both highly prized. The city of San Marino (1,600 inhabitants), formerly reached only by a mule-track, but since 1875, by a good carriage-road, is a quaint little place with steep and narrow streets and picturesque but gloomy houses of undressed stone, and containing five churches, a council-hall, an audience chamber, a law court, a little theater, a museum, and a library. In the center of the principal square (Pianello) stands a white marble statue of Liberty, presented by the duchess of Acquaviva. At the foot of the city-hill lies the Borgo di San Marino (the commercial center of the republic); and other municipal villages are Serravalle, Faetano, and Montegiardino, each with remains of its castle and fortifications.

The republic is governed by a great council (*Generale-Consiglio-Principe*) of sixty members (twenty nobles, twenty burgesses, twenty rural landowners) named for life by the council itself. From this body is elected the Council of Twelve, which with the assistance of a legal adviser decides in the third and last resort. Two captains-regent elected every six months (one from the nobles, one from the other two classes) represent the state, which also has its home secretary, its minister of foreign affairs, its chancellor of the exchequer, an army of 950 men, and a regular budget.

SAN MARTIN DE JOSÉ, Chilian general, was born at Yapeyú, on the Uruguay river, February 25, 1778. He died at Boulogne in France, August 17, 1850.

SANMICHELE, MICHELE, one of the ablest architects of his time, learned the elements of his profession from his father Giovanni and his uncle Bartolommeo, who both practiced as architects at Verona with much success. He was born in 1484, and died in 1559.

SAN MIGUEL (S. SALVADOR), or ST. MICHAELS. See AZORES.

SANNAZARO, JACOPO, one of the poets of the Renaissance in Italy, was born in 1458 at Naples of a noble family, said to have been of Spanish origin, which had its seat at San Nazaro, near Pavia. He died April 27, 1530.

SAN REMO, a town and seaport of northern Italy, at the head of a circondario in the province of Porto Maurizio, on the Western Riviera, 16¾ miles by rail east of Mentone, and 84¼ southwest of Genoa. Besides the Gothic cathedral of San Siro, the buildings of most interest are the Madonna della Costa, crowning the highest part of the old town, the town-house, and the hospital for cutaneous diseases founded by Charles Albert. The port, formed by two moles, both lengthened since 1880, was at one time much more important, its annual movement having sunk from about 1,000 in 1866 to 388 small vessels in 1884. The population of the commune (10,012 in 1861) was 16,055 in 1881—12,285 in the city proper, and 1,717 in the suburbs Poggio and Verezzo.

SAN SALVADOR, or SALVADOR (*República del Salvador*), the smallest but most densely peopled of the republics of Central America, has a coast-line of 160 miles along the Pacific from the mouth of the Rio de la Paz to that of the Goascoran in the Gulf of Fonseca, and is bounded inland by Guatemala on the west and Honduras on the north and east. Its length from east to west is 140 miles, and its average breadth about 60 miles, its area is estimated at 7,225 square miles, and in 1883 it contained 613,273 inhabitants (290,870 males, 322,403 females). With the exception of a comparatively narrow seaboard of low alluvial plains, the country consists mainly of a plateau about 2,000 feet above the sea, broken by a large number of volcanic cones, geologically of more recent origin than the main chain of the Cordillera which lies further to the north. The principal river of the republic is the Rio Lempa, which, rising near Esquipulas in Guatemala, and crossing a corner of Honduras, enters Salvador north of Citalá. Among its numerous tributaries are the Rio Santa Anna, the Asalguate, the Sumpul, and the Torola.

The volcanic forces in Salvador have not as yet spent themselves. The Izalco vent still acts as a safety valve, and the neighborhood of the capital is so subject to tremblings and rockings of the earth as to have acquired the name of the swinging mat or hammock. The city itself has been destroyed by earthquake in 1594, 1658, in 1719, and in 1854. In 1879-1880 the Lake of Ilopango was the scene of a remarkable series of phenomena. Between December 31, 1879, and January 11, 1880, the lake rose four feet above its level. The Jiboa, which flows out at the southeast corner, became, instead of a very shallow stream twenty feet broad, a raging torrent which soon scooped out for itself in the volcanic rocks a channel thirty to thirty-five feet deep. A rapid subsidence of the lake was thus produced, and by March 6th the level was thirty-four and two-fifths feet below its maximum. Toward the center of the lake a volcanic center about 500 feet in diameter rose 150 feet above the water, surrounded by a number of small islands.

It is less to these natural catastrophes than to political instability that the comparative backwardness of Salvador to develop its resources of soil and minerals must be ascribed; and considerable progress has in many respects been made since the middle of the century. Coffee is now the principal export. Indigo, for a long time the staple of the country and exported to the annual value of $20,000,000, is still extensively cultivated, so another valuable product of Salvador is always designated Balsam of Peru, though the tree from which it is obtained grows naturally nowhere else in the world except in a limited part of the Salvadorian seaboard known as the Balsam coast. Other productions of less importance are tobacco, sarsaparilla, india-rubber, and sugar. The silver mines have been and may again be of some account; and coal has been discovered inland. On the whole the trade of the country has greatly increased. The first railway, that from Acajutla to Sonsonate (fifteen miles) was opened in 1882, and has since been continued in the direction of Santa Anna, the chief commercial town. Telegraphic communication has been established between the more important towns and in July, 1882, the Central and North American Company landed its cable at La Libertad. Acajutla, La Libertad, and La Union or San Carlos de la Union (in the Gulf of Fonseca) are the principal harbors. The capital, San Salvador, has 14,059 inhabitants. Its independence of the Spanish crown dates from 1842; in 1853 it obtained the constitution under which (in a modified form) it now exists as a sovereign state.

SANSANDING, or SANSANDIG, a town in the interior of Western Africa, on the north bank of the Niger, in 13° 40′ N. latitude and 6° 25′ W. longitude, and included in the "empire" of Segu. It was visited by Mungo Park in 1796, and in 1865 by Mage and Quintin, who witnessed the stand it made against a siege by Ahmedu, sultan of Segu, from whom it had revolted. The population is estimated at 30,000 to 40,000.

SAN SEBASTIAN, a seaport of Spain, capital of the province of Guipuzcoa, 42 miles north-northwest of Pamplona, and 402 miles by rail from Madrid. It occupies a narrow isthmus, terminated toward the north by a lofty conical rock called Urgull or Orgullo, and flanked on its eastern side by the river Urmea, here crossed by a bridge, and on the other by a bay (La Concha), which forms the harbor. The houses are almost all modern, built uniformly in straight streets and regular squares, so as to present an appearance quite unlike most Spanish towns. The manufactures of the place are insignificant; and the harbor is small, and not easily accessible, though well protected by a mole and small island. There is a considerable trade in English and French goods—corn and other articles being exported. The population within the municipal boundaries was 21,355 in 1877, and 25,000 in 1890.

SAN SEVERO, a city of Italy, in the province of Foggia, and at one time the chief town of the Capitanata, lies at the foot of the spurs of Monte Gargano, and has a station on the railway to Brindisi, thirty-six miles southeast of Termoli and seventeen north of Foggia. It is the see of a bishop (since 1580), and has a handsome cathedral and some remains of its old fortifications. In 1880 the population was 19,756, and 23,000 in 1890.

SANSKRIT LANGUAGE AND LITERATURE. Sanskrit is the name applied by Hindu scholars to the ancient literary language of India. The word *samskrita* is the past participle of the verb *kar*, "to make" (cognate with Latin *creo*), with the preposition *sam*, "together" (cog. ἅμα, ὁμος, Eng. "same"), and has probably to be taken here in the sense of "completely formed" or "accurately made, polished"—some noun meaning "speech" (esp. *bhâshâ*) being either expressed or understood with it. The Sanskrit language, with its old and modern descendants, represents the easternmost branch of the great Indo-Germanic, or Aryan, stock of speech. Philological research has clearly established the fact that the Indo-Aryans must originally have immigrated into India from the northwest.

The origin of comparative philology dates from the time when European scholars became accurately acquainted with the ancient language of India. Before that time classical scholars had been unable, through centuries of learned research, to determine the true relations between the then known languages of our stock. This fact alone shows the importance of Sanskrit for comparative research. Though its value in this respect has perhaps at times been overrated, it may still be considered as the eldest daughter of the old mother-tongue. To the Sanskrit the antiquity and extent of its literary documents, the transparency of its grammatical structure, the comparatively primitive state of its accent system, and the thorough grammatical treatment it has early received at the hand of native scholars, must ever secure the foremost place in the comparative study of Indo-Germanic speech.

The history of Sanskrit literature labors under the same disadvantage as the political history of ancient India, from the total want of anything like a fixed chronology. As there are extremely few well-ascertained political facts until comparatively recent times, so in that whole vast range of literary development there is scarcely a work of importance the date of which scholars have succeeded in fixing with absolute certainty. The original composition of most Sanskrit works can indeed be confidently assigned to certain general periods of literature, but as to many of them, and these among the most important, scholars have but too much reason to doubt whether they have come down to us in their original shape, or whether they have not, rather, in course of time, undergone alterations and additions so serious as to make it impossible to regard them as genuine witnesses of any one phase of the development of the Indian mind. Nor can we expect many important chronological data from the new materials which will doubtless yet be brought to light in India. Though by such discoveries a few isolated spots may indeed be lighted up here and there, the real task of clearing away the mist which at present obscures our view, if ever it can be cleared away, will have to be performed by patient research—by a more minute critical examination of the multitudinous writings which have been handed down from the remote past. In accordance with the two great phases of linguistic development, the history of Sanskrit literature readily divides itself into two principal periods, the Vedic and the classical. It should, however, be noted that these periods partly overlap each other, and that some of the later Vedic works are included in that period on account of the subjects with which they deal, and for their archaic style, rather than for any just claim to a higher antiquity than may have to be assigned to the oldest works of the classical Sanskrit. The term *vada—i.e.*, "knowledge," (sacred) "lore"—embraces a body of writings the origin of which is ascribed to divine revelation (*scruti*, literally "hearing"), and which forms the foundation of the Brâhmanical system of religious belief.

The classical literature of India is almost entirely a product of artificial growth, in the sense that its vehicle was not the language of the general body of the people, but of a small and educated class. It would scarcely be possible, even approximately, to fix the time when the literary-idiom ceased to be understood by the common people. We know that in the third century B.C. there existed several dialects in different parts of northern India which differed considerably from the Sanskrit; and Buddhist tradition, moreover, tell us that Gautama Sâkyamuni himself, in the sixth century B.C., made use of the local dialect of Magadha (Behar) for preaching his new doctrine. Not unlikely, indeed, popular dialects, differing perhaps but slightly from one another, may have existed as early as the time of the Vedic hymns, when the Indo-Aryans, divided into clans and tribes, occupied the Land of the Seven Rivers; but such dialects must, at any rate, have sprung up after the extension of the Aryan sway and language over the whole breadth of northern India. Such, however, has been the case in the history of all nations; and there is no reason why, even with the existence of local dialects, the literary language should not have kept in touch with the people of India, as elsewhere, but for the fact that from a certain time that language remained altogether stationary, allowing the vernacular dialects more and more to diverge from it. Although linguistic research had been successfully carried on in India for centuries, the actual grammatical fixation of Sanskrit seems to have taken place about contemporaneously with the first spread of Buddhism; and indeed that popular religious movement undoubtedly exercised a powerful influence on the linguistic development of India.

The Hindus, like the Greeks, possess two great national epics, the *Râmâyana* and the *Mahâbhârata*. The *Râmâyana*, *i.e.*, poem "relating to Râma," is ascribed to the poet Vâlmîki; and, allowance being made for later additions here and there, the poem indeed presents the appearance of being the work of an individual genius. In its present form it consists of some 24,000 slokas, or 48,000 lines of sixteen syllables, divided into seven books.

King Dasaratha of Kosala, reigning at Ayodhyâ (Oudh), has four sons born him by three wives, viz., Râma, Bharata, and the twins Lakshmana and Satrughna. Râma, by being able to bend an enormous bow, formerly the dreaded weapon of the god Rudra, wins for a wife Sîtâ, daughter of Janaha, king of Videha. On his return to Ayodhyâ he is to be appointed heir-apparent; but Bharata's mother persuades the king to banish his eldest son for fourteen years to the wilderness, and appoint her son instead. After a ten years' residence in the forest, Râma attracts the attention of a female demon (Râkshasî); and, infuriated by the rejection of her advances, and by the wounds inflicted on her by Lakshmana, who keeps Râma company, she inspires her brother Râvana, demon-king of Ceylon, with love for Sîtâ, in consequence of which the latter is carried off by him to his capital Lankâ. While she resolutely rejects Râkshasa's addresses, Râma sets out with his brother to her rescue. After numerous adventures they enter into an alliance with Sugrîva, king of the monkeys; and, with the assistance of the monkey-general Hanumân, and Râvana's own brother Vibhîshana, they prepare to assault Lankâ. Having crossed over with his allies, Râma, after many hot encounters and miraculous deeds, slays the demon and captures the stronghold; whereupon he places Vibhîshana on the throne of Lankâ. To allay Râma's misgivings as to any taint she might have incurred through contact with the demon, Sîtâ now undergoes an ordeal by fire; after which they return to Ayodhyâ, where, after a triumphal entry, Râma is installed. In the last book—probably a later addition—Râma, seeing that the people are not yet satisfied of Sîtâ's purity, resolves to put her away; whereupon, in the forest, she falls in with Vâlmîki himself, and at his hermitage gives birth to two sons. Ultimately Râma discovers and recognizes them by their wonderful deeds and their likeness to himself, and takes his wife and sons back with him.

The *Mahâbhârata*, *i.e.*, "the great (poem or feud) of the Bhâratas," on the other hand, is not so much a uniform epic poem as a miscellaneous collection of epic poetry, consisting of a heterogeneous mass of legendary and didactic matter, worked into and round a central heroic narrative. The authorship of this work is aptly attributed to Vyâsa, "the arranger," the personification of Indian diaskeuasis.

Whether the story is partly based, as Lassen suggested, on historical events—perhaps a destructive war between the neighboring tribes of the Kurus and Panchâlas—or whether, as Dr. A. Holtzmann thinks, its principal features go back to Indo-Germanic times, will probably never be decided. The complete work consists of upward of 100,000 couplets—its contents thus being nearly eight times the bulk of the *Iliad* and *Odyssey* combined. It is divided into eighteen books and a supplement, entitled *Harivamsa*, or genealogy of the god Hari (Krishna-Vishnu).

The earliest direct information regarding the existence of epic poetry in India is contained in a passage of Dion Chrysostom (*c.* 80 A.D.), according to which "even among the Indians, they say, Homer's poetry is sung, having been translated by them into their own dialect and tongue;" and "the Indians are well acquainted with the sufferings of Priam, the lamentations and wails of Andromache and Hecuba, and the prowess of Achilles and Hector." Now, although these allusions would suit either poem, they seem on the whole to correspond best to certain incidents in the *Mahâbhârata*, especially as no direct mention is made of a warlike expedition to a remote island for the rescue of an abducted woman, the resemblance of which to the Trojan expedition would naturally have struck a Greek becoming acquainted with the general outline of the *Râmâyana*

As regards the leading narrative of the *Râmâyana*, while it is generally supposed that the chief object which the poet had in view was to depict the spread of Aryan civilization toward the south, Mr. T. Wheeler has tried to show that the demons of Lankâ against whom Râma's expedition is directed are intended for the Buddhists of Ceylon. Prof. Weber, moreover, from a comparison of Râma's story with cognate Buddhist legends in which the expedition to Lankâ is not even referred to, has endeavored to prove that this feature, having been added by Vâlmîki to the original legend, was probably derived by him from some general acquaintance with the Trojan cycle of legends, the composition of the poem itself being placed by the same scholar somewhere about the beginning of the Christian era. A remarkable feature of this poem is the great variation of its text in different parts of the country, amounting in fact to several distinct recensions. This diversity has never been explained in a quite satisfactory way; but it was probably due to the very popularity and wide oral diffusion of the poem. To characterize the Indian epics in a single word—though often disfigured by grotesque fancies and wild exaggerations, they are yet noble works, abounding in passages of remarkable descriptive power, intense pathos, and high poetic grace and beauty; and, while, as works of art, they are far inferior to the Greek epics, in some respects they appeal far more strongly to the romantic mind of Europe, namely, by their loving appreciation of natural beauty, their exquisite delineation of womanly love and devotion, and their tender sentiment of mercy and forgiveness.

The *Purânas* are partly legendary, partly speculative histories of the universe, compiled for the purpose of promoting some special, locally prevalent form of Brâhmanical belief. They are sometimes styled a fifth Veda, and may indeed in a certain sense be looked upon as the scriptures of Brâhmanical India.

The *Tantras*, which have to be considered as a later development of the sectarian Purânas, are the sacred writings of the numerous *Sâktas*, or worshipers of the female energy (*sakti*) of some god. This worship of a female representation of the divine power appears already in some of the Purânas; but in the Tantras it assumes quite a peculiar character, being largely intermixed with magic performances and mystic rites, partly, it would seem, of a grossly immoral nature.

A new class of epic poems begin to make their appearance about the fifth or sixth century of our era, during a period of renewed literary activity which has been fitly called the Renaissance of Indian literature. These works differ widely in character from those that had preceded them. The great national epics, composed though they were in a language different from the ordinary vernaculars, had at least been drawn from the living stream of popular traditions, and were doubtless readily understood and enjoyed by the majority of the people. The later productions, on the other hand, are of a decidedly artificial character, and must necessarily have been beyond the reach of any but the highly cultivated. They are, on the whole, singularly deficient in incident and invention, their subject matter being almost entirely derived from the old epics.

The early history of the Indian drama is enveloped in obscurity. The Hindus themselves ascribe the origin of dramatic representation to the sage Bharata, who is fabled to have lived in remote antiquity, and to have received this science directly from the god Brahman, by whom it was extracted from the Veda. The question has been argued both for and against the probability of Greek influence; but it must still be considered as *sub judice*. There are doubtless some curious points of resemblance between the Indian drama and the Modern Attic (and Roman) comedy, viz., the prologue, the occasional occurrence of a token of recognition, and a certain correspondence of characteristic stage figures (especially the Vidûshaka or jocose companion of the hero, presenting a certain analogy to the servus of the Roman stage, as does the Vita of some plays to the Roman parasite)—for which the assumption of some acquaintance with the Greek comedy on the part of the earlier Hindu writers would afford a ready explanation. On the other hand, the differences between the Indian and Greek plays are perhaps even greater than their coincidences, which, moreover, are scarcely close enough to warrant our calling in question the originality of the Hindus in this respect.

The existing dramatic literature is not very extensive. The number of plays of all kinds of any literary value will scarcely amount to fifty. The reason for this paucity of dramatic productions doubtless is that they appealed to the tastes of only a limited class of highly cultivated persons and were in consequence but seldom acted. As regards the theatrical entertainments of the common people, their standard seems never to have risen much above the level of the religious spectacles mentioned by Patanjali. Such at least is evidently the case as regards the modern Bengâlî *jâtras*—described by Wilson as exhibitions of some incidents in the youthful life of Krishna, maintained in extempore dialogue, interspersed with popular songs—as well as the similar *râsas* of the western provinces, and the rough and ready performances of the *bhanrs*, or professional buffoons. Of the religious drama Sanskrit literature offers but one example, viz., the famous *Gîtagovinda*, composed by Jayadeva in the twelfth century. It is rather a mytho-lyrical poem, which, however, in the opinion of Lassen, may be considered as a modern and refined specimen of the early form of dramatic composition. The subject of the poem is as follows: Krishna, while leading a cowherd's life in Vrindâvana, is in love with Râdhâ, the milkmaid, but has been faithless to her for awhile. Presently, however, he returns to her "whose image has all the while lingered in his breast," and, after much earnest entreaty, obtains her forgiveness. The emotions appropriate to these situations are expressed by the two lovers and a friend of Râdhâ in melodious and passionate stanza of great poetic beauty. Like the Song of Solomon, the Gîtagovinda, moreover, is supposed by the Hindu commentators to admit of a mystic interpretation; for, "as Krishna, faithless for a time, discovers the vanity of all other loves, and returns with sorrow and longing to his own darling Râdhâ, so the human soul, after a brief and fanatic attachment to the objects of sense, burns to return to the God from whence it came" (Griffith).

The profane lyrical poetry consists chiefly of such little poetic pictures, which form a prominent feature of dramatic compositions. Numerous poets and poetesses are only known to us through such detached stanzas, preserved in native anthologies or manuals of rhetoric. Thus the *Saduktikarnâmrita*, or "ear-ambrosia of good sayings," an anthology compiled by Srîdhara Dâsa in 1205, contains verses by 446 different writers; while the *Sârngadharapaddhati*, another anthology, of the fourteenth century, contains some 6,000 verses, culled from 264 different writers and works. These verses are either of a purely descriptive or of an erotic character; or they have a didactic tendency, being intended to convey, in an attractive and easily remembered form, some moral truth or useful counsel.

As regards religious lyrics, the fruit of sectarian fervor, a large collection of hymns and detached stanzas, extolling some special deity, might be made from Purânas and other works.

The particular branch of didactic poetry in which India is especially rich is that of moral maxims, expressed in single stanzas or couplets, and forming the chief vehicle of the *Nîti-sâstra* or ethic science. Excellent collections of such aphorisms have been published—in Sanskrit and German by Dr. v. Böhtlingk, and in English by Dr. J. Muir. Probably the oldest original collection of this kind is that ascribed to Chânakya, and entitled *Râjanîtisamuchchaya*, "collection on the conduct of kings." Another collection is the *Kâmandakîya-Nîtisâra*, ascribed to Kâmandaki, who is said to have been the disciple of Chânakya.

For the purposes of popular instruction stanzas of an ethical import were early worked up with existing prose fables and popular stories, probably in imitation of the Buddhist *jâtakas*, or birth stories.

In higher class prose works of fiction the Sanskrit literature is extremely poor; and the few productions of this kind of which it can boast are of a highly artificial and pedantic character. These include the *Dasakumâracharita*, or "the adventures of ten princes," composed by Dandin, about the sixth century, and the *Vâsavadattâ*, by Subandhu, the contemporary of the poet Bâna (*c.* 620), who himself wrote the first part of a novel, the *Kâdambarî*, afterward completed by his son.

SANSON, Nicolas, a French cartographer, who, while it is a mistake to call him the creator of French geography, attained a great and well-deserved eminence in his profession. He was born of an old Picardy family of Scottish descent, at Abbeville, on December 20, 1600, and was educated by the Jesuits at Amiens. He died at Paris July 7, 1667. Two younger sons, Adrien (died 1708) and Guillaume (died 1703), succeeded him as geographers to the king.

SANSOVINO, Andrea Contucci del Monte, an able Florentine sculptor, who lived during the rapid decline of plastic art which took place from about the beginning of the sixteenth century; he was the son of a shepherd called Niccolo di Domenico Contucci, and was born in 1460 at Monte Sansavino near Arezzo, whence he took his name, which is usually softened to Sansovino. He was a pupil of Antonio Pollaiuolo, and during the first part of his life worked in the purer style of fifteenth century Florence. Hence his early works are by far the best, such as the terra-cotta altar-piece in Santa Chiara at Monte Sansavino, and the marble reliefs of the *Annunciation*, the *Coronation of the Virgin*, a *Pietà*, the *Last Supper*, and various statuettes of saints and angels in the Corbinelli chapel of S. Spirito at Florence, all executed between the years 1488 and 1492. He died in 1529.

SANSOVINO, Jacopo, was called Sansovino after his master Andrea (see above), his family name being Tatti. Born in 1477, he became a pupil of Andrea in 1500, and in 1510 accompanied him to Rome, devoting himself there to the study of antique sculpture. Jacopo's chief claim to real distinction rests upon the numerous fine Venetian buildings which he designed, such as the public library, the mint, the Scuola, della Misericordia, the Palazzo de' Cornari, and the Palazzo Delfino, with its magnificent staircase—the last two both on the grand canal. He died in 1570.

SANTA ANA, a flourishing town in Orange county, Cal., with the inducements of climate, fertility of soil, and abundant natural resources to attract settlement and investments. The town contains three banks, a number of stores, religious societies and educational facilities of a superior character, also a number of manufacturing industries. The population in 1890 was 5,000.

SANTA ANNA, Antonio Lopez de, for many years a prominent figure in the troubled politics of Mexico, was born at Jálapa on February 21, 1798. Having entered the army, he joined the party of Iturbide (*q. v.*) in 1821. In the following year he quarreled with his chief and himself became leader of a party. In 1828, however, he sided with Guerrero, who made him war minister, and also commander-in-chief after a successful operation against the Spaniards in 1829. He successfully accomplished the overthrow of Guerrero in favor of Bustamante and of Bustamante in favor of Pedraza, and finally, in March, 1833, was himself elected president. In 1836 he was defeated and taken by the Texan revolutionists, but returned to Mexico the following year. In 1844, after considerable vicissitudes, he was deposed and banished, but he was brought back once more to the presidential chair in 1846. This second term of office lasted till the fall of Mexico in 1847, when he resigned. He was made president again in 1853, but finally abdicated in 1855. In 1867 he took part in "pronunciamentos" which led to his banishment. In 1874 he was permitted to return to his native soil, where he died two years afterward.

SANTA BARBARA, capital of Santa Barbara county, Cal., is a seaport of the Pacific coast and a health and pleasure resort of unexcelled attractions. It is located on Santa Barbara channel, an excellent harbor, semi-distant between Los Angeles and San Luis Obispo, and 362 miles southeast of San Francisco. The climate is mild all the year round and the scenery in the vicinity, together with the fertility of the soil in the surrounding country, has contributed in a marked degree to the growth and prosperity of the town. It contains a court-house, three banks, two daily and two weekly papers, seven churches, three institutions of learning, planing and feed mills, machine works, and two sugar factories. The town is supplied with street railway facilities, and is lighted by gas and electricity. Its population in 1890 was 8,000.

SANTA CRUZ. See Saint Croix. For Santa Cruz de Santiago see Canary Islands; and for Santa Cruz or Nitendi Island see New Hebrides.

SANTA CRUZ, the most fashionable watering place on the Pacific coast and capital of Santa Cruz county, Cal., is situated on the north side of Monterey Bay, eighty miles southeast of San Francisco. The city has communication with all points by the Southern Pacific and other railroads, also by coast steamship lines, and is otherwise provided with transportation accommodations and conveniences. In addition to its unexcelled climate the facilities and natural advantages for bathing, fishing and hunting are superior, and annually the sources of attraction to tourists and travelers from all parts of the United States and Europe. It has four banks, two daily papers, six churches, a graded school, city hall, public hall, and hospital, and is the base of operations for a large mercantile and manufacturing business. Agriculture, stock raising, and fruit and vine growing are carried on extensively in the surrounding country, and vast quantities of bitumen mined near the city are shipped to all parts of the State for purposes of paving. The population (1890) is 5,500.

SANTA FÉ, a city of the Argentine Republic, capital of the province of Santa Fé (38,600 square miles; 189,000 inhabitants), occupies an area of 400 acres, ninety miles north of Rosario, on the northeast or left bank of the Rio Salado at its junction with the Paraná, in a district subject to periodical inundations. A foundry, a macaroni-factory, oil-factories, and tile-works are the chief industrial establishments. The population in 1881 was 10,400, a decrease since 1869. Santa Fé was founded in 1573 by Juan de Garav.

SANTA FÉ, the capital of, and largest city in the Territory of New Mexico, is located on the Atchison, Topeka and Santa Fe road, which connects with the Colorado system for points at the East and on the Pacific coast. The city is twenty miles east of the Rio Grande river, within sight of the foot-hills of the Rocky Mountains, and in addition to its advantages as the capital of a large and comparatively thickly settled area of territory, is the center of a trade that is annually increasing and extending, an archeopiscopal see and the headquarters of the military division of the Pacific. Santa Fe is distant from Kansas City 869 miles; from Denver, 338 miles; from Trinidad, 216 miles; from Albuquerque, 85 miles; from Deming, 316 miles; from El Paso, 340 miles; from Los Angeles, 1,032 miles, and from San Francisco, 1,281 miles. The city is one of the oldest in America, having been founded by the Spanish in 1605, and for over 200 years was occupied exclusively by representatives of that nationality. Along in 1803–4–5 the emigration of American traders began, and the horrors of what is known as "the old Santa Fe trail" long since became the theme of the author and poet, as also the subject of artistic delineation. Within late years the old city of *adobes* has given place to a new city with all the appointments and equipments that have been discovered and utilized during the past quarter of a century, and is to-day considered one of the most promising and substantial of the cities which are struggling for precedence between the Missouri river and the Golden Gate. The city contains two banks, one daily and four weekly papers, six churches, a Roman Catholic cathedral, bishop's palace, a convent and desirable educational facilities. It is also in the center of a rich mining and agricultural region; the landscape in the vicinity of the city is diversified by high mountains and extensive forests, while gold, silver, copper, iron, limestone and quartz rock are found in quantities sufficient to reward the services enlisted in their procuration. The city contains a present (1890) population of 6,713. Her people are liberal and enterprising, and stand ready to foster and encourage any legitimate undertaking having for its object the building up and improvement of the place. Skilled labor of all kinds is in demand at good wages. The cost of living is reasonable, and real property, both inside and suburban, is steadily advancing in value, and prospects for the future prosperity of the city are far from discouraging.

SANTA FÉ DE BOGOTÁ. See BOGOTÁ.

SANTÁL PARGANÁS, THE, a British district in the lieutenant-governorship of Bengal, forming the southern portion of the Bhágalpur division, and lying between 23° 48′ and 25° 19′ N. latitude, and between 86° 30′ and 87° 58′ E. longitude. The total area of the district is 5,456 square miles; it is bounded on the north by the districts of Bhágalpur and Purniah, on the east by Maldah, Murshidábád, and Bírbhúm, on the south by Bardwán and Mánbhúm, and on the west by Hazáribagh and Bhágalpur. The Rajmahal Hills are the only range of any importance in the district, and occupy an area of 1,366 square miles; but they nowhere exceed 2,000 feet in height. Coal and iron are found in almost all parts of the country, but the coal is of such inferior quality that all attempts to work it have failed. The climate varies; the alluvial tract has the damp heat and moist soil characteristic of Bengal, while the undulating and hilly portions are swept by the hot westerly winds of Behar, and are very cool in the winter months. The average annual rainfall is over fifty inches. The district is traversed on the east by the loop line, and on the west by the chord line, of the East Indian railway; the total length of railway is about 130 miles.

The census of 1881 disclosed a total population in the Santál Parganás of 1,568,093 (males 785,330, females 782,763); Hindus numbered 847,590, Mohammedans 108,899, and Christians 3,057. The population is almost entirely rural; only two towns contain over 5,000 inhabitants each, viz., Deoghar, which is the only municipality, with a population of 8,015, and Shahebgunge with 6,512. The administrative headquarters are at Naya Dumka.

Rice forms the staple crop of the Sántál Parganás, and is largely grown in the alluvial strip of country which runs along the eastern boundary of the district. Other crops are millets, wheat, barley, maize, various pulses and oil-seeds, jute, flax, sugar-cane, cotton, and indigo.

The district is singularly destitute of any local manufactures; iron is roughly smelted by Kol settlers from Chutia Nagpur, coarse cloth is woven as a domestic manufacture, and bell-metal utensils are made to a small extent; indigo is also manufactured. The trade is carried on by means of permanent markets. Exports consist chiefly of rice, Indian corn, oil, seeds, tasar silk, cocoons, lac, small sized timber, and hill bamboos; while European piece goods, salt, and brass or bell-metal utensils for household use comprise the bulk of the imports. In 1883–84 the gross revenue of the district amounted to $227,185, of which the land tax yielded $112,780.

Since the latter part of the eighteenth century the Sántáls have been known to the British. In 1832 two government officials were deputed to demorcate with solid masonry pillars the present area of the Daman-i-Koh or skirts of the hills. The permission to Sántáls to settle in the valleys and on the lower slopes of the Daman stimulated Sántál immigration to an enormous extent. The Hindoo money-lender soon made his appearance among them and led to the rebellion of 1855–56. The insurrection was not quelled without bloodshed, but it led to the establishment of a form of administration congenial to the immigrants: and a land settlement has since been carried out on conditions favorable to the occupants of the soil.

SANTA MARGHERITA BELICE, a city of some importance in the province of Girgenti, Sicily, having a population of 7,500. A considerable area of territory is under cultivation, and grain, wine, and oil are exported. The manufactures include woven goods and hats for export.

SANTA MARGHERITA DI RAPALLO, an attractive sea coast town in the province of Genoa, Italy, about three miles from Rapallo. The Genoese coral fisheries, important industries, are principally carried on in feluccas fitted out at this port, and manned by the population, nearly all of the inhabitants being sea-faring men. The population in 1871 was 4,800; in 1881, 5,100; and in 1890, estimated at 5,700.

SANTA MARIA DI CAPUA VETERE, a city in the province of Caserta, southern Italy, having a population of 18,000. Grain and fruits are grown extensively and wine, cloth, hats, etc., make up the list of manufactures.

SANTA MARIA. See Capua.

SANTA MAURA, or Leucadia (*Δευκάδα*, ancient *Λευκάς*), one of the Ionian Islands, with an area of 110 square miles and a population (1880) of 25,000 (20,892 in 1870), lies off the coast of Acarnania (Greece), immediately south of the entrance to the Gulf of Arta. During the English occupation a canal for boats of four to five feet draught was formed from Fort Santa Maura to the town, but the sixteen-feet deep ship canal which it was proposed (1844) to carry right across the lagoon or submerged isthmus to Fort Alexander was only partially excavated. Santa Maura, measuring about twenty miles from north to south and five to eight miles in breadth, is a rugged mass of limestone and bituminous shales (partly Tertiary), rising in its principal ridges to heights of 2,000 and 3,000 feet, and presenting very limited areas of level ground. The grain crop suffices only for a few months' local consumption; but olive oil of good quality is produced to the extent of 30,000 to 50,000 barrels per annum; the vineyards (in the west especially) yield 100,000 barrels of red wine (bought mainly by Rouen, Cette, Trieste, and Venice); the currant, introduced about 1859, has gradually come to be the principal source of wealth (the crop averaging 2,500,000 pounds); and small quantities of cotton, flax, tobacco, valonia, etc., are also grown. The salt trade, formerly of importance, has suffered from Greek customs regulations. Though to a large extent unlettered and superstitious, the inhabitants are industrious and well-behaved. The chief town (5,000 inhabitants) properly called Amaxikhi, but more usually Santa Maura, after the neighboring fort, is situated at the northeast end of the island opposite the lagoon. In the southwest is the village of Vasiliki, where a wharf protected by a mole was built in 1877–78 for shipping the currant crop.

SANTANDER, a province in the north of Spain, on the shores of the Bay of Biscay, bounded on the east by Biscaya, on the south by Burgos and Palencia, and on the west by Leon and Oviedo. The area is 2,113 square miles. The province is mountainous in character, being traversed from east to west by the Cantabrian chain, which in the Picos de Europa reaches a height of over 8,700 feet, and sends off numerous branches to the sea. On the north side of the range the streams are all short, the principal being the Ason, the Miera, the Pas, the Besaya, the Soja, and the Nansa, which flow into the Bay of Biscay; part of the province lies to the southward of the watershed, and is drained by the upper Ebro. The valleys of Santander are fertile, and produce various kinds of grain, maize, pulse, hemp, flax, and vegetables. Oranges, lemons, grapes, figs, and other fruits flourish, and forests of oak, chestnut, walnut, and fir cover the hills. Rich pasturage for cattle and swine and a good supply of game are also found among them, and the fisheries along the coast are likewise productive. Foreign capital has been successfully applied to the development of lead, coal, and iron mines; and the mountains contain quarries of limestone, marble, and gypsum, and abound with mineral springs. The industries of the country are in a flourishing condition, and, besides the natural products above mentioned, there are foundries, breweries, distilleries, tanneries; cotton, linen, cloth, and flour mills; brick and file works; and manufactories of hats, soap, buttons, preserves and chocolate. The province is traversed from north to south by the railway and high road from Santander by Palencia to Madrid; the highest point on the railway (Venta de Pazozal) is 3,229 feet above the sea. The population in 1877 numbered 235,299, and in 1890 it was estimated at 259,290.

SANTANDER (*Portus Blendium*, *Fanum S. Andreæ*), capital of the above province, 316 miles by rail from Madrid, is the seat of a bishopric and one of the chief seaports of Spain. The population in 1877 numbered 41,000, having almost doubled in the preceding quarter of a century, and the trade of the port has increased in an even greater proportion. The town is situated on the inside of a rocky peninsula, which separates it from the Bay of Biscay and forms a magnificent harbor from two to three miles wide and four miles long. The entrance is at the eastern extremity of the promontory, and, though somewhat difficult for sailing vessels in certain winds, has depth of water sufficient for the largest ships. The chief exports consist of iron ore to Great Britain, and wine and olive oil to France. In addition to the manufactures of the province mentioned above, Santander has gas-works, phosphorus, sulphuric acid, and sail manufactories, and a large cigar factory, formerly a convent, where over 1,000 hands are employed. There is communication by rail with Madrid, and by steamer with Liverpool, London, and Hamburg, as well as with Havana and the seaports of Spain.

SANTAREM, a city and bishop's see of Portugal, in the province of Estremadura, on the declivities of the right bank of the Tagus, forty-six and a half miles by rail from Lisbon. A considerable trade is carried on, and the population was 7,001 in 1878, and 7,800 in 1890.

SANTAREM, a city of Brazil, at the head of a comarca in the province of Pará, is situated on the right bank near the mouth of the Rio Tapajós, a right-hand tributary of the Amazon. As the Rio Tapajós is navigable for steamers to the rapids, 170 miles above Santarem, and for boats to within a short distance of Diamantino, the town carries on a considerable trade with Matto Grosso and the country along the banks. The population and importance of the place, originally founded by a Jesuit missionary for his converts in 1661, and made a city in 1848, are still increasing.

SANTA ROSA, county seat of Sonoma county, Cal., is located in one of the most productive valleys of the State, a valley noted alike for its genial climate and the progressive character of its residents. It is situated on Santa Rosa creek about sixty-one miles north of San Francisco, with which it has communication by the San Francisco and Northern road, and about thirty miles east of the Pacific ocean. Agriculture and stock raising, with vine and fruit growing, are extensively engaged in throughout the valley, of which Santa Rosa is the distributing point, thereby making that city the center of large and steadily increasing lines of business. The city contains three banks, three daily and five weekly papers, abundant facilities for religious, educational, and commercial purposes, and gives employment to no inconsiderable amount of capital in the conduct of manufacturing industries. The population in 1890 was stated at 5,216.

SANTERRE, Jean Baptiste, French painter, born at Magny near Pontoise in 1650, was a pupil of Bon Boulogne. He died at Paris on November 21, 1717. His paintings, in consequence of his extreme care in choice of vehicles and pigments, have stood well. His *Portrait of a Lady in Venetian Costume* (Louvre), and his *Susanna at the Bath* (Louvre, engraved by Porporati), give a good impression of Santerre's taste and of his elaborate and careful method.

SAN THIAGO. See Cape Verd Islands.

SANTIAGO, the capital of Chili, and the chief town of a province of its own name (now 5,223 square miles in extent, reduced in 1883 by the formation of the new province of O'Higgins), is situated in 33° 26′ 42″ S. latitude and 70° 40′ 36″ W. longitude, at a height of about 1,830 feet above the sea, in a wide and beautiful plain between the main range of the Andes and the less elevated heights of Cuesta del Prado, 115 miles east of Valparaiso by rail. From the very first Santiago was laid out with great regularity in parallelograms; but owing to the frequency of earthquakes the dwelling-houses are seldom built of more than a single story in height. The cathedral, situated in the Plaza de la Independencia, is the oldest of the churches. Originally erected by Pedro Valdivia and rebuilt by Garcia Hurtado de Mendoza, it was destroyed by the earthquake of 1647, and rebuilt on a new plan subsequent to 1748. It is 351 feet long by 92 feet wide, but has no very striking features.

Among the secular buildings the more noteworthy are the palace of the intendency, the old presidential palace (popularly Las Cajas), the congress buildings, the mint, the palace of justice, and the municipal theater. The present university of Santiago dates from 1842—the older Universidad de San Felipe, which had been established in 1747, having been closed in 1839. It occupies a fine building in the Alameda, and alongside stands the great National Institute of Secondary Education. In 1882 the university was attended by 920 students and the institute by 1,059. The city also contains a school of arts and trades (1849), a musical conservatorio (1849), a national museum, a military school established in 1842 and enlarged on the abolition of the naval military school at Valparaiso in 1872 (now re-established), and a school of agriculture founded by the Agricultural Society chartered in 1869. The National Library is a noble collection of books dating from 1813, especially rich in works relating to America; there is also a good library in the National Institute. Besides the official journal, Santiago has four daily papers, as well as various reviews and other serials. As the Mapocho was unfit for drinking, water was introduced about 1865 by an aqueduct five miles long. The prevailing winds at Santiago are from the south and southwest. On an average rain falls for 216 hours in the course of the year, mostly between May and September. Snow and hail are both extremely rare. Earthquakes are so frequent that as many as twenty-seven or thirty shocks are sometimes registered in a year. Those which have proved really disastrous are the earthquakes of March 17, 1575; May 13, 1647; July 8, 1730; November 19, 1822; and February 20, 1835. The population of Santiago, which was returned in 1865 as 168,553 (79,920 males and 88,633 females), had increased to 200,000 in 1883 and is now (1890) 225,000.

SANTIAGO DE COMPOSTELLA, the former capital of Galicia, in the northwest of Spain, situated in 42° 52′ 30″ N. latitude and 8° 30′ 6″ W. longitude, fifty-one and a half miles west-by-south from Lugo, and thirty-two miles south-by-west from Coruña, in the province of that name. It lies on the eastern slope of the Monte Pedroso, surrounded by mountains which draw down incessant rain that gives the granite buildings of its deserted streets an extra tint of melancholy and decay. The trade of Santiago can never have been otherwise than dependent on the crowds of pilgrims who visited the shrine. It now only survives in the silversmiths' shops on the Plaza de los Plateros, which still have a steady sale for artistic pieces of peasant jewelry. Otherwise it consists in mere local traffic in cattle, linen, silk, leather, hats, and paper. There is communication by rail with the little seaport of Carril on the west coast. The population within the municipal boundaries was 23,000 in 1885.

SANTIAGO (or ST. JAGO) DE CUBA, a city and seaport of Cuba, at one time the capital of the whole island, and now the chief town of the eastern department, is situated in 19° 57′ 7″ N. latitude and 75° 54′ 3″ W. longitude (lighthouse), on a fine bay on the south coast. The spacious and well-defended harbor is accessible to the largest vessels, but silt near the wharf allows only those drawing less than fourteen feet to come alongside. The city, which climbs a hillside 150 feet above the bay, has considerably improved since 1870, though its streets are still badly paved. It contains the largest cathedral in the island, a theater, a customhouse, barracks (1858–1880), and hospitals. Foundries, soap-works, tan-yards, and cigar factories are the only industrial establishments. Besides sugar, which forms about two-thirds of the whole, the principal articles are cocoa, rum, tobacco and cigars, coffee, honey and wax, mahogany, and copper-ore—this last at one time to the extent of 25,000 tons per annum, but now in greatly diminished quantity. The copper mines Lomas del Cobre lie on the other side of the bay inland from Punta de Sal. The estimated population is between 24,000 and 30,000.

SANTIAGO DEL ESTERO, chief town of the province of Santiago in the Argentine Republic, is situated in 27° 46′ S. latitude and 64° 19′ W. longitude, 520 feet above the sea, on the banks of the Rio Dulce. The most conspicuous building is the cathedral, whose dome contrasts strangely by its size and evident costliness with the poverty of the rest of the town. The population is about 8,000 (most of whom have a great deal of Indian blood in their veins). The railway from Rosario to Santiago (689 miles) was opened in 1884.

SANTILLANA, Inigo Lopez de Mendoza, Marquis of, Castilian poet, was born at Carrion de los Condes in Old Castile on August 19, 1398. He died at Guadalajara on March 26, 1458. Mendoza was the first to introduce the Italian sonnet into Castile, but his productions in this class are somewhat conventional in style and have little to recommend them beyond the charm of smooth versification. He was much more successful in the *serranilla* or highland pastoral after the Provençal manner.

SANTINI, Giovanni, Italian astronomer, born January 30, 1787, at Caprese, in the province of Arezzo, was from 1813 director of the observatory at Padua. He wrote *Elementi di Astronomia* (2 vols. 1820, 2d ed. 1830), *Teoria degli Stromenti ottici* (2 vols. 1828), and a great many scientific memoirs and notices, among which there are five catalogues of telescopic stars between + 10° and – 15° declination from observations made at the Padua observatory. He died June 26, 1877.

SANTO DOMINGO. See Hayti.

SANTORIN. See Thera.

SANTOS, a city and seaport of Brazil in the province of São Paulo, is situated on the north side of the island of São Vicente or Engua-Guaçu, which forms the west side of the harbor-bay (an inlet three and a half miles deep, with soundings varying from four to ten fathoms). It is a well-built town with wide airy streets, and most of the better classes have their residences at Barra Fort (four miles out) and other suburban villages. Commercially the town has grown to great importance as the terminus of the whole railway system of this part of Brazil—the Santos and Jundiahy line (1867) running inland eighty-seven miles and connecting with the São Paulo and Rio de Janeiro railway and various other lines. The export of coffee (the great staple) increased from 344,800 60-kilogramme bags in 1862–3 to 537,478 in 1872–3 and 1,932,194 in 1883–4. The export and import trade is estimated to circulate $50,000,000 a year. The population has increased since 1870 from 9,000 to about 15,000.

SÃO LEOPOLDO, a German colony in the province of Rio Grande do Sul, Brazil, founded in 1824. It is connected with Porto Alegre by rail and also by the Rio do Jinos, a small but deep and navigable river. The inhabitants of the town and sixteen neighboring settlements number in all about 20,000, and are engaged in cattle-breeding and in the culture of grain, arrow-root, and sugar.

SAÔNE. See RHONE.

SAÔNE, HAUTE, a department in the northeast of France, formed in 1790 from the northern portion of Franche Comté, and traversed by the river Saône. Situated between 47° 14′ and 48° 1′ N. latitude and between 5° 21′ and 6° 49′ E. longitude, it is bounded N. by the department of the Vosges, E. by the territory of Belfort, S. by Doubs and Jura, and W. by Côte-d'Or and Haute-Marne. On the northeast, where they are formed by the Vosges, and to the south along the course of the Ognon, the limits are natural. Toward the southwest the characteristics become those of the Rhone valley generally. At Vesoul and Gray the rainfall only reaches twenty-four inches per annum.

Out of a total of 1,319,570 acres 664,846 are arable, 375,999 under forest, 153,278 natural meadows and orchards, and 31,752 vineyards. The agricultural population numbers 180,893 out of a total of 295,905. Wheat is the staple crop, next come oats, potatoes, wine, mostly of middling quality (average vintage for the last ten years 6,086,952 gallons); rye, barley, meslin, buckwheat, maize, millet, colza, beetroot, pulse, hemp, linen, tobacco, hops. The woods, which cover more than a quarter of the department, are composed of firs in the Vosges and beech trees, oaks, wych elms, and aspens in the other districts. Kirschwasser is manufactured at Fougerolles from the native cherries. The industrial population numbers 51,477; 550 workmen raise 143,842 tons of iron-ore yearly; copper, silver, and manganese exist in the department, and gold occurs in the bed of the Ognon. Rock-salt mines yield annually 11,000 tons of salt and the materials for a considerable manufacture of sulphuric, hydrochloric, and nitric acids, sulphate of soda, chloride of lime, and Epsom and Glauber salts. Coal mines, with their principal center at Ronchamp, give employment to more than 2,000 workmen, and in 1883 yielded 212,680 tons of coal. Peat, limestone, plaster, building-stone, marble, porphyry, granite, syenite, and sandstone are all worked in the department. The green porphyry pedestal of Napoleon's sarcophagus at Les Invalides and the syenite columns of the Grand Opéra in Paris were cut at Servance. Of the many mineral waters of Haute-Saône the best known are the hot springs of Luxeuil, which, with their sixteen saline and two chalybeate sources, discharge over 127,000 gallons in the twenty-four hours and are used for bathing and drinking. Besides forty-seven iron-working establishments (smelting furnaces, foundries, and wire-drawing mills, producing in 1883 4,875 tons of iron smelted by wood-fuel, 286 tons of refined iron and 1,040 tons of sheet-iron, etc.), Haute-Saône possesses copper-foundries, engineering works, steel-foundries, and factories for producing tin plate, nails, pins, files, saws, screws, shot, chains, agricultural implements, locks, spinning machinery, edge tools, etc. Window-glass is manufactured by 105 workmen and glass wares by 300, pottery and earthenware by 220 to 230. There are also about 100 brick and tile works; the paper-mills employ 329 hands, and the 21 cotton-mills (66,700 spindles and 2,518 looms, of which 154 are hand-looms) upward of 2,000. Print-works, fulling mills, hosiery factories, and straw-hat factories are also of some account; as well as sugar-works, dye-works, saw-mills, starch-works, chemical works, oil-mills, tanyards, and flour-mills. The department exports wheat, cattle, iron, wood, pottery, Kirschwasser, and cooper's wares. The Saône provides a navigable channel of forty miles, which is about to be connected with the Moselle and the Meuse by the Canal de l'Est in course of construction along the valley of the Coney. Gray is the great emporium of the water-borne trade, estimated at 200,000 tons per annum. The department has 186 miles of national roads, 3,313 miles of other roads, and 235 miles of railway—the Paris-Mulhouse and Nancy-Gray railways, crossing at Vesoul, and various other lines.

SAÔNE-ET-LOIRE, a department of the east-central region of France, formed in 1790 from the districts of Autunois, Brionnais, Chalonnais, Charollais, and Mâconnais previously belonging to Burgundy. Lying between 46° 9′ and 47° 9′ N. latitude, 3° 37′ and 5° 27′ E. longitude, it is bounded on the north by the department of Côte d'Or, east by that of Jura, southeast by Ain, south by Rhône and Loire, west by Allier and Nièvre. The two streams from which it takes its name bound the department on the southeast and on the west respectively. Between these the continental watershed between the Mediterranean and the Atlantic called the Charollais Mountains runs south and north. The Saône crosses the department from north to south, and receives on its right the Dheune, followed by the Canal du Centre and the Grosne, and on its left the Doubs and the Seille. The Loire only receives one important affluent from the right, the Arroux, which is increased by the Bourbince, whose valley is followed by the Canal du Centre. The average temperature is slightly higher at Mâcon than at Paris—the winters being colder and the summer hotter. The yearly rainfall (thirty-two inches, increasing toward the hilly districts) is distributed over 135 days; there are twenty-five days of snow and twenty-seven of storm.

Of a total area of 2,116,311 acres, 1,079,395 are arable, 371,866 forest, 292,287 natural meadows and orchards, and 106,111 vineyards. No fewer than 366,252 of the inhabitants of the department out of a total of 625,559 depend on agriculture. In 1883 the vintage yielded 22,636,636 gallons of wine, the average quantity of recent years being 21,809,018 gallons. The red wines of Mâconnais (especially those of Thorins) are those in highest repute; Pouilly produces the best white wines. The industrial classes are represented by 150,983 individuals. The coal-basin of Creusot is the sixth in importance in France. A pit at Épinac is 3,937 feet deep. Iron-ore was extracted in 1882 to the amount of 28,654 tons. Slate, limestone, building-stone, mill-stones, granite, marble, marl, plaster, bituminous schists, peat, kaolin, manganese (4,360 tons per annum), and certain precious stones are also found in the department. The most celebrated mineral waters are those of Bourbon-Lancy, six out of the seven springs being thermal. They are strongly saline. Metal-working is principally carried on at Creusot, with its 13,000 workmen and its 13 smelting furnaces, 100 puddling ovens, 4 Bessemer apparatuses, and 4 Martin's ovens, etc. The engine works produce all sorts of machines, including about 100 locomotives. The Châlon branch works turn out ships, boats, bridges, and boilers. Other foundries and forges in the department produce cast iron and certain qualities of copper and bronze. The cotton manufacture employs 14,000 spindles and 2,000 looms; silk, 2,900 spindles and 3,500 hand-looms, wool-spinning, 350 spindles. Other industrial establishments are potteries, tile-works, glass-works (6,000,000 bottles at Épinac alone), distilleries, oil-works, mineral-oil works, cooperages, tanneries, flour-mills, sugar-works—the total number being 850, with 1,372 steam engines of 27,780 horse-power. The commerce of the department, especially as regards its exports, deals mainly with coal, metals, machinery, wine, cattle, bricks, pottery, glass. It is facilitated by five navigable streams (181 miles)—Loire, Arroux, Saône, Doubs, Seille—the Canal du Centre, which unites Châlon-sur-Saône with Digoin on the Loire, and the canal from main river valley. There are 365 miles of national road, 7,098 of other roads, and 487 miles of railway.

SAO PAULO, a city of Brazil, capital of a province of the same name, is situated on the northwestern slope of the Serra do Mar, on a left hand tributary of the Tiete, a confluent of the Paraná. A new system of water-supply and drainage was constructed in 1879–80 by English engineers under a Brazilian company. The population of the city in 1879 numbered about 35,000, and about 38,500 in 1889.

Founded by the Jesuits as a college, São Paulo was made a town in 1560 instead of Santo André, destroyed by order of Mendo de Sa. In 1711 it became a city, in 1740 a bishopric, and in 1823 an "imperial city."

SÃO PEDRO DO RIO GRANDE DO SUL. See Rio Grande do Sul.

SAPOR (Shápúr or Shahpuhr), the name of three Sásánian kings. (See Persia.)

SAPPAN WOOD is one of several red dyewoods of commerce, all belonging to the Leguminous genus *Cæsalpinia*, or to the closely allied genus *Peltophorum*. It is a native of tropical Asia and the Indian Archipelago, but as it is one of the most esteemed of the red dyewoods, its cultivation has been promoted in the West Indies and Brazil. The wood is somewhat lighter in color than Brazil wood and its other allies, but the same tinctorial principle, brazilin, appears to be common to all. See Brazil Wood.

SAPPHIRE, a blue transparent variety of corundum or native alumina. It differs, therefore, from the Oriental ruby mainly in its color. The color varies from the palest blue to deep indigo, the most esteemed tint being that of blue cornflower. The sapphire is dichroic, and the color of a fine velvety stone may be resolved by means of the dichroiscope into an ultramarine blue and a yellowish-green. The origin of the blue color of the Sapphire has not been satisfactorily determined, for, although oxide of cobalt may produce it, and is invariably used for coloring imitations of the stone, yet the presence of cobalt is not always revealed in the analysis of the sapphire. According to lapidaries the hardness of the sapphire slightly exceeds that of the ruby, and it is therefore the hardest known mineral, excepting diamond. In consequence of its great hardness it was generally mounted by the ancients in a partially rough state, the surface being polished but not cut. Notwithstanding its hardness it has been occasionally engraved as a gem.

The finest sapphires are obtained from Ceylon, where they occur with other gem-stones as pebbles or rolled crystals in the sands of rivers. The sapphires have generally preserved their crystalline form better than the associated rubies. Some of the slightly-cloudy Ceylon sapphires display when cut *en cabochon* an opalescent star of six rays, whence they are called *star-sapphires* or *asterias.* A few years ago sapphires were discovered in Siam (in the province of Battambong), but the stones from this locality are mostly dull and of too dark a color. In Burmah they occur in association with rubies, but are much less numerous. They have also been recently found in Paldar, north of the Chandrabagha range. The sapphire is widely distributed through the gold-bearing drifts of Victoria and New South Wales, but the color of the stones is usually too dark. Some of the finest specimens have come from the Beechworth district in Victoria. Coarse sapphire is found in many parts of the United States, and a few stones fit for jewelry have been obtained from Corundum Hill, Macon county, N. C., and from the other localities mentioned under Ruby. The sapphire also occurs in Europe, being found in the basalts of the Rhine valley and of Le Puy in Velay, but not sufficiently fine for purposes of ornament. The sapphire has been artificially reproduced by similar methods to those described in the article Ruby.

SAPPHO (in Attic Greek *Σαπφώ*, but called by herself *Ψάπφω*, which is necessitated by the meter also in *Anthol.*, ix. 190, though Alcæus, himself an Æolian and her contemporary, calls her *Σαπφώ*), incomparably the greatest poetess the world has ever seen, was a native of Lesbos, and probably both was born and lived at Mytilene. At Lesbos she was the center of a brilliant society and head of a great poetic school, for poetry in that age and place was cultivated as assiduously and apparently as successfully by women as by men. The names of two of her rivals are preserved—Andromeda and Gorgo; but whether they also presided over similar schools or not is very doubtful, as that idea of them depends on the authority of Maximus Tyrius, which is quite worthless on this point.

In antiquity the fame of Sappho rivaled that of Homer. She was called "the poetess," as he was called "the poet." Different writers style her "the tenth Muse," "the flower of the Graces," "a miracle," "the beautiful," the last epithet referring to her writings, not her person, which is said to have been small and dark. Her poems were arranged in nine books, on what principle is uncertain; she is said to have sung them to the Mixo-Lydian mode, which she herself invented. The few remains which have come down to us amply testify to the justice of the praises lavished upon Sappho by the ancients. The perfection and finish of every line, the correspondence of sense and sound, the incomparable command over all the most delicate resources of verse, and the exquisite symmetry of the complete odes raise her into the very first rank of technical poetry at once, while her direct and fervent painting of passion, which caused Longinus to quote the ode to Anactoria as an example of the sublime, has never been since surpassed, and only approached by Catullus and in the *Vita Nuova.* Her fragments also bear witness to a profound feeling for the beauty of nature; we know from other sources that she had a peculiar delight in flowers, and especially in the rose. The ancients also attributed to her a considerable power in satire, but in hexameter verse they considered her inferior to her pupil Erinna.

SARABAND (Ital. *Sarabanda*, *Zarabanda;* Fr. *Sar-*

abande), a slow dance, generally believed to have been imported from Spain in the earlier half of the sixteenth century, though attempts have sometimes been made to trace it to an eastern origin. The most probable account is that the dance was named after its inventor—a celebrated dancer of Seville, called Zarabanda. During the sixteenth and seventeenth centuries the saraband was exceedingly popular, alike in Spain, France, Italy and England. Its music was in triple time—generally with three minims in the bar—and almost always consisted of two strains, each beginning on the first beat, and most frequently ending on the second or third. Many very fine examples of it will be found among the *Suites* and *Partitas* of Handel and J. S. Bach; but by far the finest we possess is that which Handel first composed for his overture to *Almira*, and afterward adapted to the words "Lascia, ch'io pianga," in *Rinaldo*.

SARACENS was the current designation among the Christians of Europe in the Middle Ages for their Moslem enemies, especially for the Moslems in Europe. In earlier times the name of *Saraceni* was applied by Greeks and Romans to the troublesome nomad Arabs of the Syro-Arabian desert who continually harassed the frontier of the empire from Egypt to the Euphrates. It is easy to understand how, after Islam, the name came to be extended to the Moslem enemies of the empire in general, but no satisfactory explanation has been given of the reason why the Romans called the frontier tribes Saracens. It is most natural to suppose that they adopted some name of a tribe or confederation and used it in an extended sense, just as the Syrians called all these northern nomads by the name of the tribe of Tayyi'.

SARAGOSSA. See ZARAGOZA.

SARAKHS, a town of Persia.

SÁRAN, or SARUN, a British district in the lieutenant-governorship of Bengal, lying between 25° 40′ and 26° 38′ N. latitude and 83° 58′ and 85° 14′ E. longitude. It forms one of the northwestern districts of the Patná division in the Behar province, and comprises an area of 2,622 square miles. The rivers and water-courses are very numerous, few tracts being better supplied in this respect. The principal rivers besides the Ganges are the Gandak and Ghagrá, which are navigable throughout the year. There is little or no waste land, and the district has long been noted for the high state of its cultivation. Sáran is beautifully wooded; mango trees are very numerous; and it yields large crops of rice, besides other cereals, tobacco, opium, indigo, cotton, and sugar-cane. Though possessing no railways or canals, the district is well provided with roads. The census of 1881 returned the population at 2,280,382 (1,083,565 males and 1,196,817 females); Hindus numbered 2,010,958, Mohammedans 269,142, and Christians 282. The population is entirely agricultural; there are only three towns with more than 10,000 inhabitants. Manufactures are few and of little account; the principal are indigo, sugar, brass-work, pottery, saltpeter, and cloth. The commerce of Sáran consists chiefly in the export of raw produce, of which the chief articles are oil-seeds, indigo, sugar, and grain of all sorts except rice; the imports consist principally of rice, salt, and European piece-goods. Revelganj is the chief trading mart.

SARAPIS. See SERAPIS.

SARATOFF, a government of southeastern Russia, on the right bank of the lower Volga, having Penza and Simbirsk on the north, Samara and Astrakhan on the east, and the Don Cossacks, Voronezh, and Tamboff on the west. The area is 32,624 square miles, and the population (1882) 2,113,077. The government has an irregular shape; and a narrow strip, 140 miles long, and from 20 to 45 miles wide, extending along the Volga as far south as its Sarepta bend, separates from the river the territory of the Don Cossacks. Saratoff occupies the eastern part of the great central plateau of Russia, which gently slopes toward the south so as imperceptibly to merge into the steppe region; its eastern slope, deeply cut into by ravines, abruptly falls toward the Volga.

Iron-ore is abundant; chalk, lime, and white pottery clay are extracted to a limited degree. The mineral waters at Sarepta, formerly much visited, have been superseded in public favor by those of Caucasus. Saratoff is well watered, especially in the north. The Volga, from one to seven miles in width, separates it from Samara and Astrakhan for a length of 500 miles. The tributaries of the Don are more important; the upper Medvyeditsa and the Khoper are navigated, notwithstanding their shallows, ready-made boats being brought in separate pieces from the Volga for that purpose. The Ilovla, which flows in the same direction into the Don, is separated from the Volga only by a strip of land fifteen miles wide; the two rivers are now connected by the railway (fifty-two miles) from Tsaritsyn to Kalatch, which crosses the southern extremity of Saratoff.

Lakes and marshes occur only in a few river-valleys. The region is rapidly drying up, and the forests diminishing. The climate is severe and quite continental. The soil is very fertile, especially in the north, where a thick sheet of black earth covers the plateaus; sandy clay and salt clay appear in the south

The population is various, emigrants from all parts of Russia being mixed with Finnish and Tartar stems and with German colonists. The Great Russians constitute 75 per cent of the population, Little Russians 7 per cent, Germans 7, Mordvinians 6, and Tartars 3.5 per cent. The Tchuvashes may number about 11,000, Mescheriaks about 3,000, and Poles about 5,000. All are unequally distributed. Only 285,140 of the population reside in ten towns, the remainder (1,827,937) being distributed over 5,602 villages, of which some have from 5,000 to 12,000 inhabitants, and no less than 150 reckon more than 2,000. The annual mortality is 42 per 1,000, but this high figure is more than compensated for by the births. The chief occupation is agriculture. More than one half of the arable land (6,210,000 acres) was under crops in 1881. In 1884 the returns were rye, 3,374,000 quarters (1,608,300 in 1883); wheat, 850,700; barley, 103,400; oats, 1,657,700 (2,432,700 in 1883); and various 764,400. Oil-yielding plants are also cultivated; linseed in all districts except Tsaritsyn; mustard, both for grain and oil, extensively about Sarepta and in the Kamyshin district; and sunflower (140,000 quarters) in the northern districts.

Manufactures are developing but slowly, the chief of them, those dealing with animal produce, being checked by the falling off in cattle-breeding. The 6,500 industrial manufacturing establishments of Saratoff employ an aggregate of only 17,500 workmen, with an annual production of but 20,973,500 rubles. The most considerable are cottons, woolen cloth; $322,400, tanneries, $429,150; tallow, soap, wax-candles, flour, oils, iron, and machinery. Various petty trades are rapidly developing among the peasantry. Shipbuilding is carried on in the Volga villages; wooden vessels and implements are made in the north, and pottery in several villages; and quite recently the fabrication of lead-pencils has been added at Buturlinovka. An active trade is carried on by the merchants of the chief towns—corn, hides, tallow, and oils being exported; the merchants of Saratoff, moreover, are intermediaries in the trade of southeast Russia with the central provinces. The chief ports are Saratoff, Tsaritsyn, Kamyshin, and Khvalynsk.

Saratoff, capital of the above government, situated on the right bank of the Volga, 532 miles by rail to the southeast of Moscow, has become one of the most important cities of eastern Russia, and ranks among the very few Russian cities which have more than 100,000 inhabitants. The terrace on which Saratoff is built being intersected by two ravines, the city is divided into three parts; the outer two may be considered as suburbs. A large village, Pokrovskaya, with about 20,000 inhabitants, situated on the opposite bank of the Volga, though in the government of Samara, is in reality a suburb of Saratoff. Apart from this suburb, Saratoff had in 1882 a population of 112,430 (49,660 in 1830, and 69,660 in 1859). In 1889 it was estimated at 125,000. It is better built than many towns in central Russia. The streets are wide and regular, and there are several broad squares.

Agriculture and gardening are still the support of a section of the population, who rent land in the neighborhood of the city. The culture of the sunflower deserves special mention. The local manufacturing establishments do not keep pace with the rapidly increasing trade, and their aggregate production cannot be estimated at more than $2,250,000. The distilleries are first in importance; next come the manufactures of liquors ($800,000), flour-mills (about $50,000), oil-works ($280,000), and tobacco-factories (about $200,000.) The city has not only a trade in grain, oil, hides, tallow, woolen cloth, wool, fruits, and various raw produce exported from Samara, but also a trade in salt from Crimea and Astrakhan, which is in the hands of the Samara merchants, and in iron from the Urals and wooden wares from the upper Volga governments. Saratoff also supplies southeastern Russia with manufactured articles and grocery wares imported from central Russia. The traffic of the port was estimated at about 5,700,000 rubles in 1885. The shallowness of the Volga opposite the town, and the immense shoals along its right bank are, however, a great drawback.

SARATOGA SPRINGS, a village of the United States, whose mineral waters, apart from any charm of situation, have rendered it one of the most fashionable of summer resorts. It lies in the east of Saratoga county, New York, 186 miles by rail north of New York city, on a level plateau in the valley of the Hudson, not far from the junction of this river with the stream discharging from Saratoga Lake. The number and size of its hotels (some of which are among the largest in the world and can accommodate upward of 1,000 guests) and the large influx of wealthy and fashionable visitors, bringing its population up to 30,000, render Saratoga Springs anything rather than a "village." Its resident inhabitants even numbered 8,421 in 1880, and 11,975 in 1890. There are Presbyterian, Baptist, Methodist, Episcopal, and Roman Catholic churches, a large town-hall, a high school and other educational institutions, a fire department building, a circular railway, and numerous private mansions. Congress Park was laid out in 1875–76. In July and August the race-course of the Saratoga Racing Association attracts the best patronage of the American turf.

The Indians seem at an early date to have known of the medicinal virtues of the High Rock Spring, and in 1767 Sir William Johnson, carried thither by a party of Mohawks, was restored to health by drinking its waters. General Schuyler cut a road through the forest from Schuylerville, and in 1784 erected the first frame house in the neighborhood of the springs. Hotels began to be built about 1815. New springs have from time to time been discovered, and their number has also been increased by boring, so that now there are twenty-eight in all. They rise in a stratum of Potsdam sandstone underlain by Laurentian gneiss, etc., and reach the surface by passing through a bed of blue clay. All are charged with carbonic acid gas. The following are among the most notable:—Congress Spring in Congress Park, discovered in 1792 (chloride of sodium, bicarbonates of lime and magnesium); Washington or Champagne Spring (1806); Columbian Spring (1806); Hathorn Spring (1868); Pavilion Spring (1839); Putnam Spring; Geyser Spring (bored in 1870 to a depth of 140 feet and spouting 25 feet into the air); Glacier, spouting spring (bored in 1871 to 300 feet); Flat Rock Spring, known as early as 1774, but lost, and only recovered in 1884. The water from several of the springs is largely bottled and exported. The Geyser Spring (one and one-quarter miles southwest) and White Sulphur Spring and Eureka Spring (one and one-half miles east) are also among the most important of the springs.

SARÁWAK, a territory in the northwest of Borneo, which, reclaimed from piracy and barbarism by the energy of Sir James Brooke (*q.v.*), was converted into an independent and prosperous state. With an area estimated at from 35,000 to 40,000 square miles, it has a population of about 250,000. The Bongo Hills, in the residency of Saráwak, are about 3,000 feet high; and along the frontier, where the Seraung Mountains, the Klinkong Mountains, the Batang Lupar Mountains, etc., are supposed to form more or less continuous ranges, there are altitudes of from 4,000 to 8,000 feet. In some of the limestone mountains there are caves of enormous extent. The Rejang is the largest river in Saráwak. Its sources are only 120 or 130 miles directly inland near Mount Lawi, Mount Marud (8,000 feet), and Gura Peak; but it flows obliquely southwest for 350 miles, and the principal branches of its delta (the Eyan river and the Rejang proper) embrace a territory of 1,600 square miles with a coast-line of 60 miles. At the apex of the Rejang delta lies the village and government of Sibu, and at the mouth of the Rejang branch is the important village and shipping-port of Rejang. Passing over the small river basins of the Kalukah and the Saribas we reach the Batang Lupar, which ranks next to the Rejang, and is navigable for large vessels as far as Lingga, about thirty miles from its mouth.

The mineral wealth of Saráwak is not unimportant. Gold washing has long been carried on in the central residency, though not with more than moderate success; and more recently a fairly prolific gold-field has been opened in the neighborhood of Marup, on the Batang Lupar, where there is a flourishing Chinese settlement. Of much greater value are the antimony ores which occur more especially in the district of the headstreams of the Saráwak, in the most various localities, occasionally as dykes *in situ*, but more frequently in bowlders deep in the clayey soil, or perched on tower-like summits and craggy pinnacles, accessible only by ladders. Those rich deposits have, however, been largely exhausted, and no new ones have been discovered in other parts of the territory. A deposit of cinnabar was discovered by Mr. Helms in 1867, at Tegora, at the foot of the Bongo Mountains, but no other occurrence of this ore of quicksilver in the territory has yet been reported. Coal has been worked for many years at the government mines of Simunjun, on the banks of a right-hand affluent of the Sadong. Diamonds are occasionally found, and copper, manganese, and plumbago have been discovered, but not in paying quantities.

Like the rest of Borneo, Saráwak is largely covered with forest and jungle. The bilian or ironwood is not only used locally, but exported, also india rubber (*guttsasusu*), and bird's-nests, but in diminishing quantities.

and their place is being taken by gambier and pepper, the cultivation of which was introduced by the rajah. Gambier figured at 22,432 piculs, and pepper at 43,490 piculs in the exports of 1884. The territory of Saráwak is said to furnish more than half the sago produce of the world, and most of it is grown on the marshy banks of the Oya, Mukah, and other rivers of the northern residency of Saráwak, to the distance of about twenty miles inland. The total value of the exports of Saráwak in 1884 was $1,145,248 ($1,071,528 from Kuching), that of the imports $1,083,255. Natuna and Dutch vessels are the most numerous in the shipping returns.

The government is an absolute monarchy—the present rajah being the nephew of Sir James Brooke. The military force—some 250 men—is under the control of an English commandant. There is also a small police force, and the government possesses a few small steam vessels. The civil service is regularly organized, with pensions, etc. The revenue is in a satisfactory state, showing $64,899 to the good in the period between 1875 and 1884. In 1884 the revenue was $276,269 and the expenditures $289,291. Roman Catholics and Protestants both have missions in Saráwak; and the English bishop of Singapore and Labuan is also styled bishop of Saráwak. The population consists of Malays, Chinese, Land Dyaks, Sea Dyaks, and Milanows. "Without the Chinaman," says the rajah (*Pall Mall Gazette*, September 19, 1883) "we can do nothing." When not allowed to form a secret society he is easily governed, and this he is forbidden to do on pain of death. Slavery still prevails in Saráwak, but arrangements were made for its entire abolition in 1888. Kuching, the capital of Saráwak, on the Saráwak river, is a place of 12,000 inhabitants, and is steadily growing.

SARDANAPALUS was, according to the account of Ctesias (preserved by Diodurus, 23 *sq.*), the last king of Nineveh, and he is described in terms that have made his name proverbial as the type of splendid and luxurious effeminacy. Ctesias' story cannot be called historical; but the name Sardanapalus seems to be a corruption of Assurbanipal, (*q.v.*)

SARDINE (*Clupea pilchardus*). See PILCHARD. Another of the *Clupeidæ* (*C. scombrina*) is the "oil-sardine" of the eastern coast of the Indian Peninsula.

SARDINIA (Ital. *Sardegna*, Fr. *Sardaigne*, Span. *Cerdeña*, called by the ancient Greeks *Ἰχνοῦσα*, from a fancied resemblance to the print of a foot), (see ITALY); an island in the Mediterranean about 140 miles from the west coast of Italy, of which kingdom it forms a part. It is separated from the island of Corsica by the Strait of Bonifacio, which is about seven and one-half miles wide, and only about fifty fathoms deep. Sardinia lies between 8° 4′ and 9° 49′ E. longitude, and extends from 38° 55′ to 41° 16′ N. latitude. The length from Cape Teulada in the southwest to Cape Longo Sardo in the north is about 160 miles, the breadth from Comino to Cape Caccia about sixty-eight miles. The area of the island is 9,187 square miles—that of the department (*compartimento*), including the small islands adjacent, being 9,294 square miles. It ranks sixth in point of size among the islands of Europe, coming next after Sicily.

The greater part of the island is mountainous, especially in the east, where the mountains stretch almost continuously from north to south, and advance close up to the coast. The culminating point is Monte Gennargentu, which rises, about twenty-two miles from the east coast, almost exactly on the parallel of 40° N., to the height of 6,250 feet. The western half of the island has more level land. The principal plain, that of the Campidano, stretches from southeast to northwest between the Gulf of Cagliari and that of Oristano, and nowhere attains a greater elevation than 250 feet. In the corner of the island situated to the southwest of the Campidano there are two small isolated mountains rising to the height of from 3,000 to 4,000 feet, which are of importance as containing the chief mineral wealth of the island.

The rivers are numerous, but short. The principal is the Oristano, which enters the gulf of the same name on the west coast.

Geologically the island is composed mainly of granite and other crystalline rocks.

In variety of mineral wealth the southern half of Sardinia is the richest province in Italy, and it stands second in the annual value of its mineral products. The chief minerals are sulphates of lead more or less argentiferous (galena), sulphates of silicates of zinc, ordinary iron pyrites, sulphates of iron and copper, of antimony, and of arsenic, besides cobalt, nickel, and silver. The coal on the banks of the Gennargentu is of good enough quality to furnish a valuable fuel, and is found in sufficiently thick seams to be workable if only the means of transport were present, but its situation is such as to render it of no economical importance. In the Tertiary deposits of the southwest there are some veins of manganese ore, and also some beds of lignite which are worked as a source of fuel for local use. Upward of seventy miles have been opened, most of them in the district of which Iglesais is the centre, but a few near the southern part of the east coast, where Muravera is the chief town, The mines are mostly of argentiferous lead, silver, zinc, and iron. The ores are mainly exported in the raw state, only the inferior sorts being smelted in the island. Among other mineral products are building stones (granite, marble, etc.), alabaster and salt.

The climate of Sardinia is similar to that of the rest of the Mediterranean region, and the southern half of the island shares in the nearly rainless summers characteristic of the southern portions of the Mediterranean peninsulas. Winter is the rainiest season of the year; but the heat and drought of summer (mean temperature 95° F.) make that the most unpleasant of the seasons, while in the low grounds the prevalence of malaria renders it a most unhealthy one, especially for visitors. Autumn, which is prolonged into December, is the most agreeable season; there is then neither heat nor cold, nor mist nor fever, and at that period birds of passage begin to immigrate in large numbers.

The agricultural products of the island are greatly inferior to what might be expected in view of the natural fertility of the soil. In ancient times Sardinia was one of the granaries of Rome; now cereals take a comparatively unimportant place among the exports, and this export is balanced by a considerable import of the same commodity. The chief products of agriculture are wheat, barley, and beans, the last furnishing an important element of the food of the people. Olives run wild in many places, and are grown in sufficient abundance to meet the local demand. Almonds, oranges, and citrons are also largely cultivated, and the oranges of San Vito, near Muravera, and of Milis, a few miles to the north of Oristano, are noted for their excellence; the white wines of the banks of the Oristano are of good repute; and among other products of the island are mulberries, tobacco, madder, and hemp. Forests of oak, cork-oak, firs, and pines, though greatly reduced in extent, still cover, it is said, about one-fifth of the surface. The rearing of live-stock receives more attention than agriculture proper. No artificial pasture-grasses are grown, but the natural pastures beside the numerous rivers yield abundance of food, except during the dry season, when the horses, asses, cattle, sheep, and goats have to content themselves with straw, some dried beans, and a little barley. Most attention is bestowed on horses.

The external commerce of the island has nearly trebled itself in the twenty-five years 1856–81, the imports and exports each amounting in the latter year to about $7,500,000. This increase is chiefly owing to the development of the mining industry, ores making up nearly one-third of the total value of the exports. Live animals make up about a fourth of the total value, and cereals, which come next in order, about one-seventh. The chief imports are cotton and other manufactures and colonial products. The inland trade has been greatly promoted within the last fifty years by the construction of roads and railways. Of railways, introduced since 1870, there are now 265 miles in all (equal to about one mile of railway for every thirty-four square miles of surface).

For administrative purposes Sardinia, like the rest of Italy, is divided into provinces and circles (*circondarii*).

The inhabitants of Sardinia are a hardy race, of about middle height, and of dark complexion. They are little accustomed to hard work, but this is one of the consequences of the backward state of their civilization and of the impediments already indicated to the development of the resources of the island. Education, as in many other parts of Italy, is very far behind, notwithstanding the law which makes elementary education compulsory; but here, as throughout the kingdom, it is rapidly extending. At Cagliari there is a university, attended by from 300 to 400 students.

The capital of the island is Cagliari, but Sassari in the north has an equally large population (about 34,000). The other chief towns are Tempio, Alghero, Iglesias, and Oristano. Cagliari, Alghero, and Castel Sardo are fortified. The island was annexed to Italy in 1861.

SARDIS (*αί Σάρδεις*), the capital of the kingdom of Lydia, the seat of a *conventus* under the Roman empire, and the metropolis of the province Lydia in later Roman and Byzantine times, was one of the great cities of western Asia Minor till the later Byzantine time. Its importance was due, first to its military strength, secondly to its situation on an important highway leading from the interior to the Ægean coast, and thirdly to its commanding the wide and fertile plain of the Hermus. After Constantinople became the capital of the East a new road system grew up connecting the provinces with the capital. Sardis then lay rather apart from the great lines of communication and lost some of its importance. It still, however, retained its titular supremacy, and continued to be the seat of the metropolitan bishop of the province. It is enumerated as third, after Ephesus and Smyrna, in the list of cities of the Thracesian thema given by Constantine Porphyrogenitus in the tenth century. The country round Sardis was frequently ravaged both by Christians and by Greeks during the thirteenth century. Finally in 1390 Philadelphia, which had for some time been an independent Christian city, surrendered to Sultan Bayazid's mixed army of Ottoman Turks and Byzantine Christians, and the Seljuk power in the Hermus valley was merged in the Ottoman empire. The latest reference to the city of Sardis relates its capture (and probable destruction) by Timur in 1402. Its site is now absolutely deserted, except that a tiny village, Sart, merely a few huts inhabited by semi-nomadic Yuruks, exists beside the Pactolus, and that there is a station of the Smyrna and Cassaba railway a mile north of the principal ruins.

SARDONYX, a name applied to those varieties of onyx, or stratified chalcedony, which exhibit white layers alternating with others of red or brown color. The brown chalcedony is known to modern mineralogists as *sard* and the red as *carnelian*. The simplest and commonest type of sardonyx contains two strata—a thin layer of white chalcedony resting upon a ground of either carnelian or sard; but the sardonyx of ancient writers generally presented three layers—a superficial stratum of red, an intermediate band of white, and a base of dark brown chalcedony. The sardonyx has always been a favorite stone with the cameo-engraver, and the finest works have usually been executed on stones of five strata. A famous ancient locality for sard was in Babylonia, and the name of the stone appears to be connected with the Persian word *sered*, "yellowish-red," in allusion to the color of the sard. Pliny, relying on a superficial resemblance, derives the name from Sardis, reputed to be its original locality. Imitations are fabricated by cementing two or three layers of chalcedony together, and so building up a sardonyx; while baser counterfeits are formed simply of paste. See ONYX.

SARGASSO SEA. See ATLANTIC.

SARGON, king of Assyria, 722–705 B.C., (Isa. xx. 1). See BABYLONIA and ISRAEL.

SARI. See MAZANDARÁN.

SARMATIANS (*Σαυρομάται, Συρμάται*, Sarmatæ). In the time of Herodotus (iv. 110–117) the steppes between the Don and the Caspian were inhabited by the Sauromatæ, a nomadic horse-riding people, whose women rode, hunted, and took part in battle like the men, so that legend (presumably the legend of the Greek colonists on the Black Sea) represented the race as descendants of the Amazons by Scythian fathers. That the Sarmatians, at least, were of Median origin is the express opinion of Diodorus (ii. 43) and Pliny. The country of Sarmatia, as that term is used for example by Ptolemy, means much more than the lands of the Sarmatians, comprising all the eastern European plain from the Vistula and the Dniester to the Volga, whether inhabited by nomad Sarmatians, by agricultural Slavs and Letts, or even by Finns. This Sarmatia was arbitrarily divided into an Asiatic and a European part, east and west of the Don respectively.

SARNIA, a town in the province of Ontario, Canada, is located west of London sixty-one miles, on the St. Clair river near Lake Huron. It is the capital of Lambton county and connected by ferry with Port Huron, a port of entry across the river, also with the leading cities of the Dominion and the States, by the Great Western and Grand Trunk railroads. The town contains three banks, five churches, three weekly newspapers, a brewery, saw and grist mills, shingle-mills, iron foundries, manufactories of castings, machine shops, woodenware factories, tanneries, woolen mills, etc. The population in 1890 was 5,500.

Point Edward, 2 miles from Sarnia and 168 miles west of Toronto, is also located on the Sarnia river and is important as the Canada terminus of the Grand Trunk railway. It contains a number of stores, hotels, saw-mills, etc., and is connected with Fort Gratiot, Mich., on the opposite side of the river by steam ferry. The population is 1,500.

SARNO, a city of Italy, in the province of Salerno, thirty miles east of Naples by rail, lies at the foot of the Apennines near the sources of the Sarno, a stream connected by canal with Pompeii and the sea. Paper, cotton, silk, linen, and hemp are manufactured. The population of the town in 1881 was 11,445. Previous to its incorporation with the domains of the crown of Naples, Sarno gave its name to a countship held in succession by the Orsini, Cappola, Suttavilla, and Colonna families.

SARPI, PIETRO. was born at Venice, August 14, 1552, and was the son of a small trader, who left him an orphan at an early age. He was the author of the *History of Ecclesiastical Benefices*, published in 1610, and of the *History of the Council of Trent*. He died January 23, 1623.

SARRAZIN, Jacques, French painter, born at Noyon in 1588, was a pupil of the father of Simon Guillain, but he went to Rome at an early age and worked there under a Frenchman named Anguille. Starting thus, Sarrazin speedily obtained employment from Cardinal Aldobrandini at Frascati, where he won the friendship of Domenichino, with whom he afterward worked on the high altar of St. Andrea della Valle. His return to Paris, where he married a niece of Simon Vouet's, was signalized by a series of successes which attracted the notice of Sublet des Noyers, who intrusted to him the work by which Sarrazin is best known, the decoration of the great portal and dome of the western façade of the interior court of the Louvre. The mausoleum for the heart of the Prince of Condé in the Jesuit church of the Rue Saint Antoine was his last considerable work (see Lenoir, *Musee des Monuments Français*, v. 5); he died December 3, 1660, while it was in progress, and the crucifix of the altar was actually completed by one of his pupils named Gros.

SARSAPARILLA, a popular alterative remedy, prepared from the long, fibrous roots of several species of the genus *Smilax*, indigenous to Central America, and extending from the southern and western coasts of Mexico in the north, to Peru in the south. These plants grow in swampy forests seldom visited by European travelers, and, being diœcious and varying much in the form of leaf in different individuals, they are but imperfectly known to botanists, only two species having been identified as yet with any degree of certainty. These are *Smilax officinalis*, Kth., and *S medica*, Schlecht. and Cham., which yield respectively the so-called "Jamaica," and the Mexican varieties. The introduction of sarsaparilla into European medicine dates from the middle of the sixteenth century. It is regarded by many as a valuable alterative and diaphoretic in chronic rheumatism, syphilis, and various skin diseases, but by others as possessing little if any remedial value. It is frequently prescribed in combination with powerful medicines, such as iodide of potassium or bichloride of mercury.

The varieties of sarsaparilla met with in commerce at present are the following: The Jamaica sarsaparilla of trade is collected on the Cordilleras of Chiriqui, in that part of the isthmus of Panama which adjoins Costa Rica, where the plant yielding it grows at an elevation of 4,000 to 8,000 feet, and is brought down to Boca del Toro on the Atlantic coast for shipment. Lima sarsaparilla resembles the Jamaica kind, but the roots are of a paler brown color, and are formed into cylindrical bundles of similar length, but only about two and a half inches in diameter. Honduras sarsaparilla occurs in the form of cylindrical rolls about thirty inches long and four or more in diameter, closely wound round with a long root so as to form a neat bundle. The roots are less wrinkled, and the bark is whiter and more starchy, than in the Jamaica kind. It is exported from Belize to the extent of about 10,000 pounds annually. Guatemala sarsaparilla is very similar to that of Honduras, but has a more decided orange hue, and the bark shows a tendency to split off. Guayaquil sarsaparilla is obtained chiefly in the valley of Alausi on the western side of the equatorial Andes. The roots are roughly packed in large bales and are not made into separate hanks, and the chump or rootstock is often allowed to remain attached to the roots. The bark is thick and furrowed, and of a pale fawn color internally; the rootlets are few, and the root itself is of larger diameter than in the other kinds. Mexican sarsaparilla also is not made up into hanks, but is packed in straight lengths of about three feet into bales, the chump and portions of an angular but not square stem being frequently attached to the roots. The latter are slender, shriveled, and nearly devoid of rootlets. This kind of sarsaparilla is collected on the eastern slope of the Mexican Andes throughout the year and is the produce of *Smilax medica*, Schlecht and Cham.

The name of Indian sarsaparilla is given to the roots of *Hemidesmus indicus*, R. Br., an Asclepiadaceous plant indigenous to India. These roots are readily distinguished from those of true sarsaparilla by their loose cracked bark and by their odor and taste, recalling those of melilot.

SARTHE, a department of the northwest region of France, formed in 1790 out of the eastern part of Maine, twenty-nine communes of Anjou and portions of Perche. Situated between 47° 35′ and 48° 30′ N. latitude, and between 0° 25′ W. and 0° 55 E. longitude, it is bounded north by the department of Orne, northeast by Eure-et-Loir, east by Loir-et-Cher, south by Indre-et-Loire and Maine-et-Loire, and west by Mayenne. The mean annual temperature differs but slightly from that of Paris. The rainfall is about twenty-four inches, or rather below the average for France.

Of a total surface of 1,533,760 acres, 982,635 acres in the department are arable, 198,517 under wood, 190,176 in meadows and grass, 42,000 in moors, and 22,284 in vineyards. There are three distinct districts—the corn lands to the north of the Sarthe and the Huisne; the moorlands, partly planted with pine, between those two streams and the Loir; and the wine-growing country to the south of the Loir. In 1883 the grain crop yielded 2,813,387 bushels of wheat, 951,039 of meslin, 714,248 of rye, 2,317,760 of barley, 1,993,049 of oats, 30,880 of maize, and 59,680 of buckwheat; and there were 9,536,312 bushels of potatoes and 92,521 of beans, pease, etc., 81,664 tons of beetroot, 4,794 tons of hemp, and 6 of flax. In 1884 cider was produced to the extent of 15,473,414 gallons (average quantity per annum in previous years 8,628,444 gallons), and wine to 4,347,134 gallons (average quantity 3,883,330). Fodder was grown to the amount of 381,110 tons; and there were considerable supplies of chestnuts and hazel nuts —Château du Loir being the principal market for the former. From the forests, which consist mainly of oaks, witch-elms, chestnut-trees, pines, and beeches, material is drawn to the value of $700,000. The agriculture of the district has made great progress through the opening up of roads, improvements, draining, and irrigation. Besides mines of anthracite and other coal, iron-ore, marble, freestone, slate, millstones, clay, marl, lime, tuffeau (a kind of white chalky tuff), magnesia, and peat are all worked. The staple industry is the weaving of hemp and flax (3,395 spindles, 4,400 looms, 400 being power-looms). The cotton manufacture ranks next (8,700 spindles, 185 looms, of which 100 are power-looms), while woolen manufacture employs only 350 spindles and 161 looms. In the paper-mills 569 workmen are engaged. Iron-foundries, copper and bell foundries, potteries, tile-works, glass-works and stained glass manufactories, currieries, engine and carriage factories, wire-gauze factories, flour-mills, and distilleries are also carried on; and altogether about 256 steam-engines with 2,480 horse-power are employed in those establishments. The commerce of the department is facilitated by ninety-nine miles of navigable rivers (Sarthe and Loir), 250 miles of national roads, 6,707 miles of other roads, and 352 miles of railway.

With its 438,917 inhabitants (1881) Sarthe has exactly the average density of population in France. From 1801 (380,821) to 1866 (465,615) the number was on the increase, but since that date there has been a decline. The four arrondissements are named from Le Mans, the chief town; La Flèche (9,424 inhabitants), famous for its prytanée militaire; Mamers (6,070 inhabitants); and St. Calais (3,600). There are thirty-three cantons and 387 communes. Sablé (6,000 inhabitants) contains a castle built for Colbert by Mansart; and hard by was the celebrated Benedictine abbey of Solesmes.

SARTI, Giuseppe, musical theorist and composer, was born at Faenza, Italy, December 1, 1729, educated —according to the best accounts—by Padre Martini, and appointed organist of the cathedral of Faenza before the completion of his nineteenth year. Resigning his appointment in 1750, Sarti devoted himself with ardor to the study of dramatic music, and in 1751 produced his first opera *Pompeo*, with great success. His next works, *Il Rè Pasiore*, *Medonte*, *Demofoonte*, and *L'Olimpiade*, assured him so brilliant a reputation that in 1753 King Frederick V. of Denmark invited him to Copenhagen, with the appointments of hofkapellmeister and director of the opera.

In 1784 Sarti was invited by the empress Catherine II. to St. Petersburg. On his way thither he stopped at Vienna, where the emperor Joseph II. received him with marked favor, and where he made the acquaintance of Mozart. His most successful operas in Russia were *Armida* and *Olega*, for the latter of which the empress herself wrote the libretto. Sarti died at Berlin, July 28, 1802.

SARTO Andrea del. This celebrated painter of the Florentine school was born in Gualfonda, Florence, in 1487, or perhaps 1486, his father Agnolo being a tailor. He died at Florence, January 22, 1531.

Various portraits painted by Andrea are regarded as likenesses of himself, but this is not free from some doubt. Among his more renowned works are the following: *The Virgin and the Child*, with St. Francis and St. John the Evangelist and two Angels, now in the Uffizi, painted for the church of S. Francesco in Florence; this is termed the *Madonna di S. Francesco*, or *Madonna delle Arpie*, from certain figures of harpies which are decoratively introduced, and is rated as Andrea's masterpiece in oil-painting. The altar-piece in the Uffizi, painted for the monastery of S. Gallo, the *Fathers Disputing on the Doctrine of the Trinity—Sts. Augustine, Dominic, Francis, Lawrence, Sebastian, and Mary Magdalene*—a very energetic work. Both these pictures are comparatively early—toward 1517. The *Charity* now in the Louvre (perhaps the only painting which Andrea executed while in France). The *Pietà*, in the Belvedere of Vienna; this work, as well as the *Charity*, shows a strong Michelangelesque influence. At Poggio a Caiano a celebrated fresco (1521) representing Julius Cæsar receiving tribute, various figures bringing animals from foreign lands—a striking perspective arrangement; it was left unfinished by Andrea, and was completed by Alessandro Allori. Two very remarkable paintings (1523) containing various incidents of the life of the patriarch Joseph, executed for the Borgherini family. In the Pitti Gallery two separate compositions of the *Assumption of the Virgin*, also a fine *Pietà*. In the Madrid Museum the *Virgin and Child*, with Joseph, Elizabeth, the infant Baptist, and an Archangel. In the Louvre the *Holy Family*, the Baptist pointing upward. In Panshanger a fine portrait named *Laura*. The second picture in the National Gallery ascribed to Andrea, a *Holy Family*, is by some critics regarded as the work rather of one of his scholars—we hardly know why.

SASANIANS. See Persia.

SASINE. See Seisin.

SASSARI, the chief town of the northern province of the island of Sardinia (Italy), is situated in the midst of orange and olive groves at a height of 650 feet above the sea, 12½ miles from Porto Torres, on the railway to Chilivani, a junction on the main line from Terranova to Cagliari. Till about 1860–65 it was surrounded by a high wall built in the fourteenth century and strengthened by twenty-six large square towers from sixty to eighty feet high. The castle dates from 1327–31. The city besides contains a municipal palace, rebuilt since 1820, an episcopal palace dating originally from the thirteenth century, and a university founded by Philip III. of Spain, in 1617, as well as barracks, law courts, hospitals, and asylums. Most of the streets are narrow and tortuous, and vehicles are generally drawn by oxen. Sassari is separated by a low and swampy stretch of country from its port at Porto Torres—a village on the site of *Turris Libisonis, Colonia Julia*. The population of the city was 22,945 in 1862, 31,596 in 1881, and 35,000 in 1890.

SÁSSERÁM, a subdivision of the Sháhábád district, Bengal, India, between 24° 31′ and 25° 23′ N. latitude, and between 83° 33′ and 84° 30′ E. longitude, with an area of 1,493 square miles, and a population in 1881 of 519,207 (males 253,757, females 265,450). This subdivision consists of four thanahs or stations, viz., Sásserám, Khargar, Dhangáon, and Dehree. The thanah of Sásserám has an area of 691 square miles, and a population (1881) of 155,760 (75,031 males, 80,729 females). It contains the tomb of the Afghan Sher Shah, who conquered Humayun, and subsequently became emperor of Delhi.

SATALI, Adalia, or Andaliyeh, one of the principal towns on the east coast of Asia Minor, giving the name of Gulf of Adalia to the great bay which the ancients styled Mare Pamphylicum. Arranged like a Greek theater round the harbor, it presents an unusually picturesque appearance against its background of mountains; and it is inclosed by a triple wall of modern construction, strengthened by a ditch and square towers. The population was estimated by Spratt at 13,000, of whom 3,000 were Greeks.

SÁTÁRA, or Sattarah, a British district in the central division of the Bombay presidency in India, between 16° 50′ and 18° 10′ N. latitude and 73° 45′ and 75° E. longitude. It has an area of 4,988 square miles, and is bounded on the north by the river Nira and the states of Bhor and Phaltan, on the east by Sholapur district, on the south by the Varna river separating it from the Kolhapur and Sangli states, and on the west by the Sahyádri mountains, which separate it from the Concan districts of Kolabá and Ratnágiri. The Sátára district contains two main systems of hills, the Sahyádri range and its offshoots, and the Mahádeo range and its offshoots; the former runs through the district from north to south, and the Mahádeo range starts about 10 miles north of Mahábaleshwar and stretches east and southeast across the whole breadth of the district. Within the limits of Sátára are two river systems—the Bhima system in a small part of the north and northeast, and the Kistna system throughout the rest of the district. (See Kistna.) The hill forests have a large store of timber and firewood. The hills consist of trap intersected by strata of basalt and topped with laterite, while, of the different soils on the plains, the commonest is the black loamy clay containing carbonate of lime. The Deccan trap area is a very fertile soil, and when well watered is capable of yielding heavy crops. Sátára district contains some important irrigation works—including the Kistna, open for 35 miles. There is no railway, but the West Deccan railway, which is in course of construction, will put the district into communication with Poona and Belgaum, and will run through Sátára for about 100 miles.

According to the last census returns (1881) the population of Sátára district was 1,062,359 (532,525 males and 529,825 females). Hindus numbered 1,008,918, Mohammedans 36,712, and Christians 886. Four towns had more than 10,000 inhabitants—Sátára (see below), Wai 11,676, Karad 10,778, Tasgaon 10,206. Agriculture supports more than three-fourths of the people; the soil is fertile, and joar forms the staple food; rice is grown in the western valleys, and in the south and east cotton is raised. In 1882–83, of 1,384,255 acres held for tillage, 270,244 were fallow or under grass, while of the remaining 1,114,011 acres 39,757 were twice cropped; cereals, consisting chiefly of joar and bajra, occupied 898,206 acres, pulses 159,211 acres, oil-seeds 42,001 acres, and miscellaneous crops the remainder. Besides blankets and coarse cotton cloth the chief exports are grain, tobacco, oil-seeds, chillies, molasses, and a little raw cotton; the imports are piece-goods, hardware, salt, and dates. The gross revenue of the district in 1883–84 amounted to $1,343,895, of which the land contributed $1,143,740.

SÁTÁRA, chief town and headquarters of the above district, is situated in 17° 41′ 25″ N. latitude and 74° 2′ 10″ E. longitude, immediately below a remarkably strong hill fort on the summit of a small, steep, rocky hill. It takes its name from the seventeen walls, towers, and gates which the Sátára fort was supposed to possess. With a height of 2,320 feet above sea-level, Sátára is about sixty miles from the coast, and sixty-nine miles south of Poona. Since the death of the last raja in 1848 the population has considerably decreased; still Sátára contained in 1881 some 28,601 inhabitants (14,558 males and 14,043 females).

SATIN-WOOD, a beautiful light-colored hard wood having a rich silky luster, sometimes finely mottled or grained, the produce of a large tree, *Chloroxylon Swietenia*, native of India and Ceylon. A similar wood, known under the same name, is obtained in the West Indies, the tree yielding which is said to be *Maba guianensis*. Satin-wood was in request for rich furniture about the end of the eighteenth century, the fashion then being to ornament panels of it with painted medallions and floral scrolls and borders. Now it is used for inlaying and small veneers, and most largely in covering the backs of hair and cloth brushes and in making small articles of turnery.

SATIRE. Satire, in its literary aspect, may be defined as the expression in adequate terms of the sense of amusement or disgust excited by the ridiculous or unseemly, provided the humor is a distinctly recognizable element, and that the utterance is invested with literary form. Without humor, satire is invective; without literary form, it is mere clownish jeering. It is indeed exceedingly difficult to define the limits between satire and the regions of literary sentiment into which it shades. The lofty ethical feeling of a Johnson or a Carlyle borders it on the one hand, the witty sarcasm of a Talleyrand, rancorous or good-natured, on the other; but, however exalted the satirist's aims, or amiable his temper, a basis of contempt or dislike is the groundwork of his art.

The first exercise of satire was no doubt sufficiently coarse and boisterous. It must have consisted in gibing at personal defects; and Homer's description of Thersites, the earliest example of literary satire that has come down to us, probably conveys an accurate delineation of the first satirists, the carpers and fault-finders of the clan. The character reappears in the heroic romances of Ireland, and elsewhere; and it is everywhere implied that the licensed backbiter is a warped and distorted being, readier with tongue than his hands. In the accounts that have come down to us of the writings of Archilochus, the first great master of satire (about 700 B.C.), we seem to trace the elevation of the instrument of private animosity as an element in public life. Archilochus also gave satiric poetry its accepted form by the invention of the iambic trimeter, slightly modified into the scazonic meter by his successors. Simonides of Amorgus, about a generation later, and Hipponax, a century later still, were distinguished like Archilochus for the bitterness of their attacks on individuals, with which the former combined a strong ethical feeling, and the latter a bright active fancy. With Hipponax the direct line of Greek satire is interrupted. Fable is first heard of in Asiatic Greece about this date; and, although its original intention does not seem to have been satirical, its adaptability to satiric purposes was soon discovered and turned to account. Every variety of satire is exemplified in the comedies of Aristophanes; and if he does not rank as the first of satirists it is only because he is so much beside.

A rude form of satire had existed in Italy from an early date in the shape of the Fescennine verses, the rough and licentious pleasantry of the vintage and harvest, which, lasting down to the sixteenth century, inspired Tansillo's *Vendemmiatore*. The Romans thus had originated the name of satire, and, in so far as the Fescennine drama consisted of raillery and ridicule, possessed the thing also; but it had not yet assumed a literary form among them. Livius Andronicus (240 B.C.), the first regular Latin dramatic poet, appears to have been little more than a translator from the Greek. Satires are mentioned among the literary productions of Ennius (200 B.C.) and Pacuvius (170 B.C.), but the title rather refers to the variety of meters employed than to the genius of the composition. The real inventor of Roman satire is Caius Lucilius (148–103 B.C.), whose *Satiræ* seem to have been mostly satirical in the modern acceptation of the term, while the subjects of some of them prove that the title continued to be applied to miscellaneous collections of poems, as was the case even to the time of Varro, whose "Saturæ" included prose as well as verse, and appear to have been only partially satirical. Yet another form of satire, the rhetorical, was carried to the utmost limits of excellence by Juvenal, the first example of a great tragic satirist. Nearly at the same time Martial, improving on earlier Roman models now lost, gave that satirical turn to the epigram which it only exceptionally possessed in Greece, but has ever since retained. The brevity, pregnancy, and polish of the Latin tongue were never more felicitously exemplified than by this gifted writer. Lucian's position as a satirist is something new, and could not, from the nature of the case, have been occupied by any of his predecessors. Next to his wit, Lucian's special note is his sturdy love of truth and demand for genuineness in all things. With him antique satire expires as a distinct branch of literature—though mention should be made of the sarcasms and libels with which the population of Egypt were for centuries accustomed to insult the Roman conqueror and his parasites.

The first real important satire, however, is a product of Western Europe, recurring to the primitive form of fable, upon which, nevertheless, it constitutes a decided advantage. *Reynard the Fox*, a genuine expression of the shrewd and homely Teutonic mind, is a landmark in literature. It gave the beast-epic a development of which the ancients had not dreamed, and showed how cutting ridicule could be conveyed in a form difficult to resent. About the same time, probably, the popular instinct, perhaps deriving a hint from Rabbinical literature, fashioned Morolf, the prototype of Sancho Panza, the incarnation of sublunar mother-wit contrasted with the starry wisdom of Solomon; and the *Till Eulenspiegel* is a kindred Teutonic creation, but later and less significant. *Piers Ploughman*, the next great work of the class, adapts the apocalyptic machinery of monastic and anchoritic vision to the purposes of satire. The clergy were scourged with their own rod by a poet and a Puritan too earnest to be urbane. Partly, perhaps, because Erasmus was no poet, the Lucianic dialogue was the form in the ascendant of his age. Erasmus not merely employed it against superstition and ignorance with infinite and irresistible pleasantry, but fired by his example a bolder writer, untrammeled by the dignity of an arbiter in the republic of letters. The ridicule of Ulric von Hutten's *Epistolæ Obscurorum Virorum* is annihilating, and the art there for the first time fully exemplified though long previously introduced by Plato, of putting the ridicule into the mouth of the victim, is perhaps the most deadly shaft in the quiver of sarcasm. It was afterward used with even more pointed wit though with less exuberance of humor by Pascal, the first modern example, if Dante may not be so classed, of a great tragic satirist. Ethical satire is vigorously represented by Sebastian Brant and his imitator Alexander Barclay. In the succeeding period politics takes the place of literature and religion, producing in France the *Satyre Ménippée*, elsewhere the satirical romance as represented by the *Argenis* of Barclay, which may be defined as the adaptation of the style of Petronius to state affairs. In Spain, where no freedom of criticism existed, the satiric spirit took refuge in the *novela picaresca*, the prototype of Le Sage and the ancestor of Fielding; Quevedo revived the mediæval device of the vision as the vehicle of reproof; and Cervantes' immortal work might be classed as a satire were it not so much more. About the same time we notice the appearance of direct imitation of the Roman satirists in English literature.

Most of the great dramatists of the seventeenth century were more or less satirists, Molière perhaps the most consummate that ever existed. The next great example of unadulterated satire is Butler's *Hudibras*, and perhaps one more truly representative of satiric aims and methods cannot easily be found. At the same period dignified political satire, bordering on invective, received a great development in Andrew Marvell's *Advices to a Painter*, and was shortly afterward carried to perfection in Dryden's *Absalom and Architophel;* while the light literary parody of which Aristophanes had given the pattern in his assaults on Euripides, and which Shakespeare had handled somewhat carelessly in the *Midsummer Night's Dream*, was effectively revived in the duke of Buckingham's *Rehearsal*. In France Boileau was long held to have attained the *ne plus ultra* of the Horatian style in satire and of the mock-heroic, but Pope was soon to show that further progress was possible in both. The polish, point, and concentration of Pope remain unsurpassed, as do the amenity of Addison and the daring yet severely logical imagination of Swift; while the *History of John Bull* and the *Pseudologia* place their friend Arbuthnot in the first rank of political satirists. The eighteenth century was, indeed, the age of satire. English humor also played an important part in the literary regeneration of Germany, where, after Liscow and Rabener, direct imitators of Swift and the essayists, Lessing, imbued with Pope but not mastered by him, showed how powerful an auxiliary satire can be to criticism—a relation which Pope had somewhat inverted. Another great German writer, Wieland, owes little to the English, but adapts Lucian and Petronius to the eighteenth century with playful if somewhat mannered grace. Goethe and Schiller, Scott and Wordsworth, are now at hand, and as imagination gains ground satire declines. Byron, who, in the eighteenth century, would have been the greatest of satirists, is hurried by the spirit of his age into passion and description, bequeathing, however, a splendid proof of the possibility of allying satire with sublimity in his *Vision of Judgment*. Moore gives the epigram a lyrical turn; Béranger, not for the first time in French literature, makes the gay chanson the instrument of biting jest; and the classic type receives fresh currency from Auguste Barbier.

In all the characteristics of his genius Thackeray is thoroughly English, and the faults and follies he chastises are those especially characteristic of British society. Posterity will go to him for the humors of the age of Victoria, as they go to Addison for those of Anne's. The machinery employed by Moore was indeed transplanted to America by Russell Lowell, whose *Biglow Papers* represent perhaps the highest moral level yet attained by satire. In no age has the spirit of satire been so generally diffused as in the nineteenth century, but many of its eminent writers, while bordering on the domains of satire, escape the definition of satirist. The term cannot be properly applied to Dickens, the keen observer of the oddities of human life; or to George Eliot, the critic of its emptiness when not inspired by a worthy purpose; or to Balzac, the painter of French society; or to Trollope, the mirror of the middle classes of England. If *Sartor Resartus* could be regarded as a satire, Carlyle would rank among the first of satirists; but the satire, though very obvious, rather accompanies than inspires the composition. One remarkable feature of the age is the union of caricature with literature to a degree inconceivable before the improvements in wood-engraving. All large capitals now have their comic illustrated journals, destined for the most part to be the marvels and stumbling-blocks of posterity. The present tendencies of the civilized world seem highly favorable to the influence of satire as a factor in human affairs, but unfavorable to the production of satiric masterpieces. Satire is the inevitable concomitant of freedom of speech, which must continue to prevail and diffuse itself unless checked by military or socialistic despotism.

SATRAP. See PERSIA.

SATURN, an ancient Italian god, whom the Romans, and until recently the moderns, identified with the Greek god Cronus.

Saturnalia.—This, the great festival of Saturn, was celebrated on the 19th, but, after Cæsar's reform of the calendar, on the 17th, of December. Augustus decreed that the 17th should be sacred to Saturn and the 19th to Ops. Henceforward it appears that the 17th and 18th were devoted to the Saturnalia, and the 19th and 20th to the Opalia, a festival of Ops. Caligula added a fifth day, "the day of youth" (*dies juvenalis*), devoted no doubt to the sports of the young. But in popular usage the festival lasted seven days. The time was one of general joy and mirth. The woolen fetters were taken from the feet of the image of Saturn, and each man offered a pig. During the festival schools were closed; no war was declared or battle fought; no punishment was inflicted. In place of the toga an undress garment was worn. Distinctions of rank were laid aside: slaves sat at table with their masters or were actually waited on by them, and the utmost freedom of speech was allowed them. Gambling with dice, at other times illegal, was now permitted and practiced. All classes exchanged gifts, the commonest being wax tapers and clay dolls. These dolls were especially given to children, and the makers of them held a regular fair at this time. Varro thought that these dolls represented original sacrifices of human beings to the infernal god. There certainly was, as we have seen, a tradition that human sacrifices were once offered to Saturn, and the Greeks and Romans gave the name of Cronus and Saturn to a particularly cruel Phœnecian Baal, to whom, *e.g.*, children were sacrificed at Carthage. The Cronus to whom human sacrifices are said to have been offered in Rhodes was most probably a Baal, for there are unmistakable traces of Phœnecian worship in Rhodes. It may be conjectured that the Saturnalia was originally a celebration of the winter solstice. Hence the legend that it was instituted by Romulu under the name of the Brumalia (*bruma*=winter solstice). The designation of the planets by the names of gods is at least as old as the 4th century B.C. The first certain mention of the star of Cronus (Saturn) is in Aristotle (*Metaphysics*, p. 1073b, 35). The name also occurs in the *Epinomis* (p. 987b), a dialogue of uncertain date, wrongly ascribed to Plato. In Latin, Cicero (first century B. C.) is the first author who speaks of the planet Saturn. The application of the name Saturn to a day of the week (*Saturni dies*, Saturday) is first found in Tibullus (i. 3, 18).

SATYR. In ancient Greek mythology the satyrs were spirits, half-human, half-bestial, that haunted the woods and mountains, companions of Pan and Dionysus. Fancy represented them as strongly built, with flat noses, pointed ears, and the tails of horses or goats. They were roguish and wanton but faint-hearted folk, lovers of wine and women, ever roaming the wild to the music of pipes and cymbals, castanets and bagpipes, dancing with the nymphs or pursuing them, striking terror into men, whose cattle they killed and whose women they made love to. In the earlier Greek art they appear as old and ugly, much like wild apes; but in later art, especially in works of the Attic school, this savage character is softened into a more youthful and graceful aspect. The symbol of the shy and timid satyr was the hare. In some districts of modern Greece the spirits known as Calicantsars offer points of resemblance to the ancient satyrs; they have goats' ears and the feet of asses or goats, are covered with hair, and love women and the dance.

SAUL, son of Kish, king of Israel. (See Israel). The name of Saul's father Kish (קיש) seems to be identical with the Arabic proper name and god-name Kais.

SAULT DE STE. MARIE, the capital of Chippewa county, Mich., is located on St. Marie River and St. Mary's Falls ship canal, 14 miles from Lake Superior and 149½ miles east of Marquette. It is a busy, thriving, pushing town connected with all parts of the east and west by a railway system composed of the Duluth, South Shore and Atlantic (Soo Line) and the Canadian Pacific, the latter coming in over the International Bridge. It is also the terminus of the Great Northern Transportation Company of Collingwood, the Canada Transit Company to Owen Sound, and the Delta Transportation Company to Mackinaw Island. The navigation of the river, which was formerly obstructed by the rapids, has been improved by the construction of the ship-canal above referred to, at the same time preserving the enormous water-power estimated at over 700,000 horse-power, which is utilized in the manufacture of lumber and by other productive industries. The town has five churches, several schools, three banks, three weekly papers, and four hotels, in addition to two opera houses and a music hall with a total seating capacity of 2,500, also a number of saw-mills. Fishing and the fur trade are extensively engaged in. The population in 1889 is stated at between 7,000 and 10,000.

SAUMAISE. See Salmasius.

SAUMAREZ, James Saumarez or Sausmarez Baron de, English admiral, was descended from an old family, and was born at St. Peter Port, Guernsey, March 11, 1757. He was raised to the peerage as Baron de Saumarez in 1831, and died at Guernsey, October 6, 1836.

SAUMUR, a town of France, at the head of an arrondissement in the department of Maine-et-Loire, is situated on an island and on the left bank of the Loire, thirty-eight miles southwest of Tours, and twenty-seven miles southeast of Angers. A large metal bridge connects the Tours-Angers railway with that of Montreuil-Bellay, by which Saumur communicates with Poitiers and Niort. Two stone bridges (755 and 905 feet long) also unite the town on the island with the two banks of the river. The cavalry school, founded in 1768, and after various interruptions reorganized in 1824 and 1853, has at the present time (1886) 400 pupils, of whom 125 are officers. Other establishments are a public library, a museum of natural history and local Roman and Celtic antiquities, a horticultural garden, with a school of vines in which eight hundred kinds of grapes are cultivated. Saumur carries on a large trade in sparkling white wines grown in the neighborhood, as well as in brandy, grain, flax, and hemp; and it manufactures enamels and rosaries. The population in 1881 was 13,439, and 15,000 in 1890.

SAUNDERSON, Nicholas, mathematician, was born at Thurlstone, Yorkshire, in January, 1682. When about a year old he lost his sight through smallpox; but this did not prevent him from acquiring, by the help of kind friends, a good knowledge of Latin and Greek, and pursuing with assiduity and success the study of mathematics. In his twenty-fifth year he commenced lecturing in Cambridge on the principles of the Newtonian philosophy, and, in November, 1711, he was selected to succeed Whiston, the Lucasian professor of mathematics in Cambridge, after having had the degree of master of arts conferred upon him to render him eligible for the appointment. He was created doctor of laws in 1728 by command of George II., and in 1736 was admitted a member of the Royal Society. He died of scurvy on April 19, 1739.

SAURIANS. See Reptiles.

SAURIN, Jacques, one of the group of great French preachers of the seventeenth century (see France), was born at Nîmes on January 6, 1677, studied at Geneva, settled in London in 1701 as one of the pastors of the Walloon church, and died at The Hague, on December 30, 1730, whither he had gone to defend himself before the synod against a trumped-up charge of heterodoxy.

SAUROPSIDA. This name was introduced by Huxley in his *Introduction to the Classification of Animals*, 1869, to designate a province of the *Vertebrata* formed by the union of the *Aves* with the *Reptilia*. In his *Elements of Comparative Anatomy*, 1864, he had used the term "Sauroids" for the same province. The five divisions of the *Vertebrata*—*Pisces*, *Amphibia*, *Reptilia*, *Aves*, and *Mammalia*—are all distinctly definable, but their relations to one another differ considerably in degree. The *Amphibia* are more similar to the *Pisces* than to any of the other divisions, and the *Aves* are closely allied to the *Reptilia*, and thus three provinces—*Ichthyopsida*, *Sauropsida*, and *Mammalia*—are formed.

The characteristics which distinguish the *Sauropsida*, that is, which are common to birds and reptiles, and not found combined in the other classes, have been thus summarized by Huxley: No branchiæ at any period of existence; a well developed amnion and allantois present in the embryo; a mandible composed of many bones and articulated to the skull by a quadrate bone; nucleated blood-corpuscles; no separate parasphenoid bone in the skull; and a single occipital condyle. In addition to these principal characteristics, others exist which are found in all birds and reptiles, but are not exclusively confined to them. The oviduct is always a Müllerian duct separate from the ovary and opening from the body cavity. The adult kidney is a metanephros with separate ureter; the mesonephros and mesonephric duct become in the adult male the efferent duct of the testis. The intestine and the reproductive and urinary ducts open into a common cloaca. There is usually an exoskeleton in the form of scales; in the birds the scales take the form of feathers. There are two aortic arches in reptiles, in birds only one—the right. The heart is usually trilocular, becoming quadrilocular in crocodiles and birds. In all the eggs are meroblastic and large, possessing a large quantity of yolk; in all the egg is provided in the oviduct with a layer of albumen, and outside this with a horny or calcareous shell. In a few cases the egg is hatched in the oviduct, but in these cases there is no intimate connection between the embryo and the walls of the duct.

Comparative anatomy clearly shows that birds are reptiles which have become specialized in adaptation to the function of flight. This conclusion has been confirmed in the most surprisingly complete manner by the discovery of fossil forms intermediate between birds and reptiles. In the Rocky Mountain region numerous toothed birds have been recently discovered, and have been studied and described in a masterly fashion by Prof. O. C. Marsh. These forms belong to the Mesozoic period. For further details see REPTILES and BIRDS.

SAUSSURE, HORACE BENEDICT DE, one of Switzerland's most celebrated physicists, was born in Geneva on February 17, 1740. His youth was passed at his father's farm, where he early acquired a love for the study of nature. He was associated in a research on the leaves of plants, having devoted himself at first to botany. Thus he was led to make the acquaintance of Haller, who was not long in discerning and appreciating his rare powers as an observer. In 1762, when only twenty-two years of age, Saussure was elected to the chair of philosophy at Geneva, where, along with another professor, he taught logic and physics alternately. The Society of Arts of Geneva was founded by Saussure in 1772, and in 1774, at the invitation of the government, he elaborated a plan for the reform of the system of teaching in his native town; but this was too radical in its nature to be adopted. In 1786 he resigned his professorship to his friend and fellow-worker Pictet. While honoring his country by his devotion to laborious scientific investigations, he exhibited his patriotism by untiring diligence in the exercise of his duties as a member of the council of Two Hundred, and afterward of the National Assembly. In consequence of over-exertion in this work his health began to fail in 1794; but, although deprived of the use of his limbs, he continued to revise the concluding volumes of his great work on Alpine physiography, which were published in 1796. Latterly his mind became enfeebled, and when he was offered a chair of philosophy by the French Government in 1798 he had lapsed into a condition of partial imbecility. He died on January 22, 1799, at the age of fifty-nine, leaving two sons and a daughter.

The Alps formed the center of Saussure's investigations. They forced themselves on his attention as the grand key to the true theory of the earth; but, as year by year his mass of facts assumed ever-growing dimensions, his generalizations became more guarded, until finally he came to consider a simple recording of observations as the only justifiable course.

Saussure's work is collected and summarized in his four large volumes of *Voyages dans les Alpes*. This book is arranged in the form of a narrative of the author's various journeys, interspersed with accounts of the observations made and descriptions of the apparatus employed.

SAUSSURE, NICOLAS THÉODORE DE, eldest son of Horace Benedict de Saussure, was born on October 14, 1767, at Geneva, and is known chiefly for his work on the chemistry of vegetable physiology. He latterly became more of a recluse than ever, and died in April, 1845.

SAVAGE, RICHARD, a mediocre poet and notorious literary character of the time of Pope, associated with Pope in the publication of the *Dunciad*, was born in 1697 and died in 1743.

SAVANNAH, the capital of Chatham county, Ga., the second city in the State, and one of the most attractively laid out and handsomely built cities of the South, is located on the Savannah river, eighteen miles from its mouth. The city was founded by General Oglethorpe, in 1733, was chartered in 1789, and during the Civil War was a prominent depot of supplies for the Confederate armies operating in the southwest. It is the northern terminus of the Savannah, Florida and Western, the southern terminus of the Charleston and Savannah, and the eastern terminus of the Georgia Central roads, over each of which lines the traffic to and from Savannah is annually gaining in volume and importance. In addition to the transportation accommodations thus furnished, the city is in almost daily communication, by steamship and sailing vessels, with Boston, New York, Baltimore, Philadelphia, New Orleans and other cities of the United States and Europe. It occupies a sandy plain forty feet above tide-water, and the streets, which cross each other at right angles, are broad and airy, shaded with forest trees of many varieties, intersected with parks at regular intervals, and illuminated at night with gas and electric lights. Among the leading parks are Oglethorpe park, and Forsyth place, beautifully designed and handsomely decorated and embellished points of attraction to citizens and strangers.

Johnson Square and Monterey Square are equally conspicuous and favorite places of resort. The former contains a monument to Nathaniel Greene and the latter to Count Pulaski, heroes of the Revolution who were prominently identified with the defense of the city and the State during that period in the history of the Commonwealth. Forsyth Place contains a monument to the Confederate dead. Brick and stone are the materials employed in the construction of the buildings both in the residence and business portions of the city. All of these are substantial, and many of them in their plans and finishing display a quality of architectural skill and taste, frequently the subjects of commendable comment. Among the more prominent of the public buildings are the government buildings, court-house, city-hall, merchants' exchange, cotton exchange, Masonic, Mozart and Metropolitan halls, the opera house, Odd Fellows' hall, Hodgson's hall occupied by the Georgia Historical Society, Armory and St. Andrews halls, the St. John's Episcopal church, Roman Catholic cathedral, Independent Presbyterian church, the Jewish synagogue of Mickva, and many others. The religious and social organizations of the city are in the last degree representative of the high character of citizens, as the financial and commercial circles are equally representative of their substantial and reliable worth. It contains eight banks with a total cash capital of more than $3,000,000, and a surplus approximatting $1,000,000, thirty churches, thirteen of which are for colored congregations, three hospitals, one medical college, several reading-rooms, one or more public libraries and a large number of stores. The educational system is the graded school, in which instruction is given to pupils through the regular gradations from primary to high-school. In addition to this there are numerous academies and institutes of extended and established reputation. Among the charitable institutions are the Episcopal Orphans' Home, Savannah Hospital, St. Joseph's Infirmary, Hibernian Society, Port Society, etc. There are two daily and four weekly papers published in the city; a number of first-class hotels and other features of metropolitan enterprise, including street-railways, paid police and fire department, and an excellent water supply. The manufactures embrace iron foundries, saw and planing mills, rice and flour mills, cotton compresses, paper and cotton mills, furniture, ice, and sash, door and blind factories, etc. The harbor opposite the city is one of the most accessible and commodious along the Atlantic coast. The chief articles of export are cotton, rice, naval stores, and lumber. As a cotton market Savannah, next to New Orleans, is the largest in the United States. The population in 1850 was 15,312; in 1860, 22,292; in 1870, 28,235; in 1880, 30,709, and 43,189 in 1890.

SAVARY, ANNE JEAN MARIE RÉNÉ, duke of Rovigo, was born at Marcq, in the canton of Grandpré and department of Ardennes, on April 26, 1774. His first military experiences were with the army of the Rhine under Custine; he distinguished himself under Moreau and Férino, and by 1797 had reached the rank of major. In the next year, under Desaix, he took part in the Egyptian expedition, and he followed the same general in the second Italian campaign, and at the great battle of Marengo (June 14, 1800). So early as 1800, while only twenty-six years of age, he was appointed a colonel, and the commander of that legion which was afterward to form the picked bodyguard of the emperor. In 1803 he was general of brigade, and in 1804 he was charged with the execution of the Duc d'Enghien. Savary was the hand which Napoleon employed in the delicate negotiations with the emperor Alexander about the time of the battle of Austerlitz in 1805. At Jena in 1806 he distinguished himself. From 1808 to 1810 he was again beside Napoleon in the many and changing scenes of his exploits; but on June 8th of the latter year France itself, now fully alive to the vast and mysterious power he had learned to wield, was startled by his appointment as successor to Fouché in the ministry of police. His administration, however, was not a success. After the overthrow of Napoleon he desired to accompany his master to St. Helena, but this was refused, and he was imprisoned at Malta. He retired to Rome, where he remained till 1831, when he was appointed commander-in-chief of the African army, and intrusted with the administration of Algeria. His duties were successfully performed, but he returned in March, 1833, in weak health to Paris, where he died on June 2d.

SAVIGLIANO, a city of Italy, in the province of Cuneo, thirty-one and a half miles by rail south of Turin, lies in a plain between the Maira and the Mellea (head-streams of the Po) 1,081 feet above the sea. The population was 9,932 in 1881 (commune 17,150).

SAVIGNY, FRIEDRICH CARL VON, was born at Frankfort-on-the-Main on February 21, 1779. In 1803 he published his famous treatise, *Das Recht des Besitzes*, or the right of possession. It was at once hailed by Thibaut as a masterpiece. In 1808 he was appointed by the Bavarian Government ordinary professor of Roman law at Landshut, where he remained a year and a half, and where he left many pleasant memories. In 1810 he was called, chiefly at the instance of William von Humboldt, to Berlin, to fill the chair of Roman law, and assist in organizing the new university. In 1814 appeared his pamphlet *Vom Beruf unserer Zeit für Gesetzgebung und Rechtswissenschaft.* It was a protest against the demand for codification, and in particular against the extension of the Code Napoléon to Germany.

In 1815 he founded, with Eichhorn and Göschen, the *Zeitschrift für geschichtliche Rechtswissenschaft*, the organ of the new historical school, of which he was the representative. The record of the remainder of Savigny's life consists of little else than a list of the merited honors which he received at the hands of his sovereign, and of the works which he published with indefatigable activity. He died in 1861.

SAVILE. See HALIFAX.

SAVILE, SIR HENRY, a learned Englishman, was the second son of Henry Savile, and was born at Over Bradley, near Halifax, Yorkshire, November 30, 1549. He died at Eton College February 19, 1622, and was buried in the chapel there.

SAVINGS BANKS (Fr. *caisses d'épargne;* Germ. *Sparkassen*) are institutions for the purpose of receiving small deposits of money and investing them for the benefit of the depositors at compound interest. They are, in general, managed by benevolent persons, who seek no remuneration for their services. They originated in the latter part of the eighteenth century—a period marked by a great advance in the organization of provident habits in general (see FRIENDLY SOCIETIES). They had been, however, one of the many excellent projects suggested by Daniel Defoe in 1697. The earliest institution of the kind in Europe was one established at Brunswick in 1765; it was followed in 1778 by that of Hamburg, which still exists, in 1786 by one at Oldenburg, in 1790 by one at Loire, in 1792 by that of Basel, in 1794 by one at Geneva, which had but a short existence, and in 1796 by one at Kiel in Holstein. In Great Britain, in 1797, Jeremy Bentham revived Defoe's suggestion under the name of "Frugality Banks," and in 1799 the Rev. Joseph Smith put it in action at Wendover. This was followed in 1801 by the addition of a savings bank to the friendly society which Mrs. Priscilla Wakefield had established in 1798. Savings banks were shortly after established in London, Bath, Ruthwell in Dumfriesshire, Edinburgh, Kelso, Hawick, Southampton, and many other places.

Savings banks in the United States differ from those in the United Kingdom in the manner in which their funds are invested, not being limited to government securities. Thus, of the $1,000,000,000 of deposits only $230,000,000 was invested in United States bonds.

SAVOIE, a department of southeastern France, formed in 1860 of the districts of Upper Savoy, Savoy proper, Tarentaise, and Maurienne, which formed the southern part of the province of Savoy in the kingdom of Sardinia. Situated between 45° 5′ and 45° 55′ N. latitude and between 5° 37′ and 7° 5′ E. longitude, it is bounded north by the department of Haute-Savoie, northwest by Ain, west by Isère, south by Hautes-Alpes, and southeast and east by Piedmont (Italy), the limits for the most part consisting of ridges of the Alps, and on the northwest being determined by the Rhone and its affluents, the Fier and the Guier.

With a total area of 1,423,254 acres, Savoy comprises 434,921 acres of uncultivated ground, 239,700 acres of arable, 205,105 in forests, 172,980 in meadows, 27,183 in vineyards. More than half of the inhabitants (194,704 out of 266,438) are engaged in agriculture.

SAVOIE, Haute, a frontier department of France, formed in 1860 from the old provinces of Genevois, Chablais, and Faucigny, which constituted the northern half of the duchy of Savoy in the kingdom of Sardinia. Situated between 45° 40′ and 46° 25′ N. latitude and between 5° 50′ and 7° 2′ E. longitude, it is bounded north by the Lake of Geneva, east by the Valais canton, southeast by the duchy of Aosta (Italy), south and southwest by the department of Savoie, west by the department of Ain, from which it is separated by the Rhone, and northwest by the canton of Geneva.

With its 274,087 inhabitants (1881), who all speak French and are almost exclusively Roman Catholics, Haute-Savoie is only about one-tenth below the average density of France. It forms the diocese of Annecy; the court of appeal and the university academy are at Chambéry, and the department is included in the fourteenth corps d'armée district (Grenoble). There are four arrondissements—Annecy (population of town 11,000), Bonneville (2,270), St. Julien (1,500), and Thonon (5,440)—28 cantons, and 314 communes.

SAVONA, a city of Italy, in the province of Genoa, twenty-five and one-half miles west of that town, and ninety-one miles south of Turin by rail, is, after Genoa and Nice, the most important of the cities of the Riviera. A large import trade has since grown up, especially in coals (300,000 tons from Great Britain and France), which can be loaded directly from the ship into the trucks. The exports are confined to the products of the local industries, fruit, hoop-staves, etc. The potteries which have been long established at Savona export their earthenware to all parts of Italy; and there are glass-works, soap-works, and one of the largest iron foundries in North Italy. Shipbuilding is also carried on. The population of the commune, which includes the suburbs of Fornaci, Lavagnola, Legino and Zinola, and San Bernardo, was 19,611 in 1861, and 29,614 in 1881, that of the city at the latter date being 19,120.

SAVONAROLA, Girolamo. The roll of Italian great men contains few grander names than that of Savonarola, and the career of this patriot-priest, reformer, and statesman is one of the strangest pages of Italy's history. Amid the splendid corruptions of the Italian Renaissance he was the representative of pure Christianity, the founder and ruler of an ideal Christian republic, and, when vanquished by the power of Rome, suffered martyrdom for the cause to which his life had been dedicated. His doctrines have been the theme of interminable controversies and contradictory judgments. He has been alternately declared a fanatic bent on the revival of mediæval barbarism and an enlightened precursor of the reformation, a true Catholic prophet and martyr, and a shameless impostor and heretic. It is enough to say here that his best biographers and critics give satisfactory proofs that he was chiefly a reformer of morals, who, while boldly denouncing Papal corruptions, preserved an entire belief in all the dogmas of the Roman Catholic Church. Girolamo Savonarola was born at Ferrara September 21, 1452.

His first success as a preacher was gained at St. Gemignano (1484–85), but it was only at Brescia in the following year that his power as an orator was fully revealed. In a sermon on the Apocalypse he shook men's souls by his terrible threats of the wrath to come, and drew tears from their eyes by the tender pathos of his assurances of divine mercy. A Brescian friar relates that a halo of light was seen to flash round his head, and the citizens remembered his awful prophecies when in 1512 their town was put to the sack by Gaston de Foix.

Soon, at a Dominican council at Reggio, Savonarola had occasion to display his theological learning and subtlety. The famous Pico della Mirandola was particularly impressed by the friar's attainments, and is said to have urged Lorenzo de' Medici to recall him from Lombardy. When Savonarola returned to Florence in 1490 his fame as an orator had gone there before him. The cloister garden was too small for the crowds attending his lectures, and on August 1, 1490, he gave his first sermon in the church of St. Mark. To quote his own words, it was "a terrible sermon," and legend adds that he foretold that he should preach for eight years.

In 1491 he was invited to preach in the Cathedral Sta Maria del Fiore, and his rule over Florence may be said to begin from that date. The anger and uneasiness of Lorenzo de' Medici gave testimony to his power. Five of the leading men of Florence were sent to urge him to moderate his tone, and in his own interest and that of his convent, to show more respect to the head of the state. But Savonarola rejected their advice.

In the July of the same year he was elected prior of St. Mark's. As the convent had been rebuilt by Cosimo, and enriched by the bounty of the Medici, it was considered the duty of the new superior to present his homage to Lorenzo. Savonarola, however, refused to conform to the usage.

In April, 1492, Lorenzo de' Medici was on his deathbed at Careggi. Oppressed by the weight of his crimes, he needed some assurance of divine forgiveness from trustier lips than those of obsequious courtiers, and summoned the unyielding prior to shrive his soul. Savonarola reluctantly came, and, after hearing the agitated confession of the dying prince, offered absolution upon three conditions. Lorenzo asked in what they consisted. First, "You must repent and feel true faith in God's mercy." Lorenzo assented. Secondly, "You must give up your ill-gotten wealth." This, too, Lorenzo promised, after some hesitation; but upon hearing the third clause, "You must restore the liberties of Florence," Lorenzo turned his face to the wall and made no reply. Savonarola waited a few moments and then went away. And shortly after his penitent died unabsolved.

Savonarola's influence now rapidly increased. Many adherents of the late prince came over to his side, disgusted by the violence and incompetency of Piero de' Medici's rule. All state affairs were mismanaged, and Florence was fast losing the power and prestige acquired under Lorenzo. The same year witnessed the fulfilment of Savonarola's second prediction in the death of Innocent VIII. (July, 1492); men's minds were full of anxiety, and the scandalous election of Cardinal Borgia to the papal chair heralded the climax of Italy's woes.

Meanwhile Savonarola continued to denounce the abuses of the church and the guilt and corruption of mankind, and thundered forth predictions of heavenly wrath. The scourge of war was already at hand, for in 1494 the duke of Milan demanded the aid of France, and King Charles VIII. brought an army across the Alps. Piero de' Medici, maddened with fear, and forgetting that hitherto Florence had been the firm friend of France, made alliance with the Neapolitan sovereign whose kingdom was claimed by Charles. Then, repenting this ill-judged step, he hurried in person to the French camp at Pietra Santa, and humbled himself before the king. And, not content with agreeing to all the latter's demands, he further promised large sums of money and the surrender of the strongholds of Pisa and Leghorn.

This news drove Florence to revolt, and the worst excesses were feared from the popular fury. But even at this crisis Savonarola's influence was all-powerful, and a bloodless revolution was effected. Piero Capponi's declaration that "it was time to put an end to this baby government" was the sole weapon needed to depose Piero de' Medici. The resuscitated republic instantly sent a fresh embassy to the French king, to arrange the terms of his reception in Florence. Savonarola was one of the envoys, Charles being known to entertain the greatest veneration for the friar who had so long predicted his coming and declared it to be divinely ordained. He was most respectfully received at the camp, but could obtain no definite pledges from the king, who was bent on first coming to Florence. During Savonarola's absence Piero de' Medici had reentered the city, found his power irretrievably lost, and been contemptuously but peaceably expelled. It is a proof of the high esteem in which Savonarola's convent was held that, although the headquarters of the victorious popular party, Piero's brother, Cardinal Medici, intrusted to its care a large share of the family treasures.

Returning full of hope from Pietra Sanda, Savonarola might well have been dismayed by the distracted state of public affairs. There was no government, and revolted Pisa was secretly favored by the monarch who was knocking at the gates of Florence. Nevertheless, with the aid of Capponi, he guided the bewildered city safely through these critical days. Charles entered Florence on November 17, 1494, and the citizens' fear evaporated in jests on the puny exterior of the "threatened scourge." But the exorbitance of his demands soon showed that he came as a foe. All was agitation; disturbances arose, and serious collision with the French troops seemed inevitable. The signory resolved to be rid of their dangerous guests; and, when Charles threatened to sound his trumpets unless the sums exacted were paid, Capponi tore up the treaty in his face and made the memorable reply: "Then we will ring our bells." The monarch was cowed, accepted moderate terms, and, yielding to Savonarola's remonstrances, left Florence on November 24th.

The city was now free but in the utmost disorder, its commerce ruined, its treasury drained. After seventy years' subjection to the Medici it had forgotten the art of self-government, and felt the need of a strong guiding hand. So the citizens turned to the patriot monk whose words had freed them of King Charles, and Savonarola became the lawgiver of Florence. The first thing done at his instance was to relieve the starving populace within and without the walls; shops were opened to give work to the unemployed; all taxes, especially those weighing on the lower classes, were reduced; the strictest administration of justice was enforced, and all men were exhorted to place their trust in the Lord. And, after much debate as to the constitution of the new republic, Savonarola's influence carried the day in favor of Soderini's proposal of a universal or general government, with a great council on the Venetian plan, but modified to suit the needs of the city.

Meanwhile events were taking a turn hostile to the prior. Alexander VI. had long regretted the enfranchisement of St. Mark's from the rule of the Lombard Dominicans, and now, having seen a transcript of one of Savonarola's denunciations of his crimes, resolved to silence this daring preacher at any cost. Bribery was the first weapon employed, and a cardinal's hat was held out as a bait. But Savonarola indignantly spurned the offer, replying to it from the pulpit with the prophetic words; "No hat will I have but that of a martyr, reddened with my own blood."

So long as King Charles remained in Italy, Alexander's concern for his own safety prevented all vigorous measures against the friar. But no Borgia ever forgot an enemy. He bided his time, and the transformation of skeptical Florence into an austerely Christian republic, claiming the Savior as its head, only increased his resolve to crush the man who had wrought this marvel.

A signory, openly hostile to Savonarola, took office in May, and, on Ascension Day, his enemies ventured on active insult. His pulpit in the duomo was defiled, an ass's skin spread over the cushion, and sharp nails fixed in the board on which he would strike his hand. The outrage was discovered and remedied before the service began; and, although the Arrabbiati half filled the church, and even sought to attempt his life, Savonarola kept his composure and delivered a most impressive sermon. But the incident proved the bitterness and energy of his foes, and the signory, in feigned anxiety for the public peace, besought him to suspend his discourses. Shortly afterward the threatened bull of excommunication was launched against him, and Frà Mariano was in Rome stimulating the pope's wrath. Savonarola remained undaunted. The sentence was null and void, he said. His mission was divinely inspired; and Alexander, elected simoniacally and laden with crimes, was no true pope. Nevertheless the reading of the bull in the duomo, with the appropriate, terrifying ceremonial, made a deep impression on the Florentines.

The year 1498, in which Savonarola was to die a martyr's death, opened amid seemingly favorable auspices. The Piagnoni were again at the head of the state, and by their request the prior resumed his sermons in the duomo, while his dearest disciple, Frà Domenico Buonvicini, filled the pulpit of St. Lorenzo. Scaffoldings had to be erected to accommodate Savonarola's congregation, and the Arrabbiati could only vent their spite by noisy riots on the piazza outside the cathedral. For the last time the carnival was again kept with strange religious festivities, and many valuable books and works of art were sacrificed in a second bonfire of "vanities." But menacing briefs poured in from Rome; the pope had read one of Savonarola's recent sermons on Exodus; the city itself was threatened with interdict, and the Florentine ambassador could barely obtain a short delay. Now too the Piagnoni quitted office; the new signory was less friendly, and the prior was persuaded by his adherents to retire to St. Mark's.

Undismayed by personal danger, Savonarola resolved to appeal to all Christendom against the unrighteous pontiff, and dispatched letters to the rulers of Europe adjuring them to assemble a council to condemn this antipope. The council of Constance, and the deposition of John XXIII., were satisfactory precedents still remembered by the world. One of these letters being intercepted and sent to Rome by the duke of Milan (it is said) proved fatal to the friar. The papal threats were now too urgent to be disregarded, and the cowed signory entreated Savonarola to put an end to his sermons. He reluctantly obeyed, and concluded his last discourse with the tenderest and most touching farewell. Perhaps he foresaw that he should never again address his flock from the pulpit.

The government now hoped that Alexander would be appeased and Florence allowed to breathe freely. But although silenced, the prophet was doomed, and the folly of his disciples precipitated his fate. A creature of the Arrabbiati, a Franciscan friar named Francesco di Puglia, challenged Savonarola to prove the truth of his doctrines by the ordeal of fire. At first the prior treated the provocation with merited contempt, but unfortunately his too zealous disciple Frà Domenico accepted the challenge. And, when the Franciscan declared that he would enter the fire with Savonarola alone, Frà Domenico protested his willingness to enter it with any one in defense of his master's cause. So, as Savonarola resolutely declined the trial, the Franciscan deputed a convert, one Giuliano dei Rondinelli, to go through the ordeal with Frà Domenico.

On April 7, 1498, an immense throng gathered in the Piazza della Signoria to enjoy the barbarous sight. Two thick banks of combustibles forty yards long, with a narrow space between, had been erected in front of the palace, and 500 soldiers kept a wide circle clear of the crowd. Some writers aver that the piles were charged with gunpowder. Not only the square but every window, balcony, or housetop commanding a glimpse of it was filled with eager spectators. The Dominicans from one side, the Franciscans from the other, marched in solemn procession to the Loggia dei Lanzi, which had been divided by a boarding into two separate compartments. The Dominicans were led by Savonarola carrying the host, which he reverently deposited on an altar prepared in his portion of the loggia, and when Frà Domenico was seen to kneel before it the Piagnoni burst into a song of praise. The magistrates signaled to the two champions to advance. Frà Domenico stepped forward, but neither Rondinelli nor Frà Francesco appeared. The Franciscans began to urge fantastic objections. The Dominicans' vestments might be bewitched, they said. Then, when he promptly changed them for a friar's robe, they pretended that his proximity to Savonarola had probably renewed the charm. He must remove the cross that he wore. He again complied—was ready to fulfill every condition in order to enter the fire. But fresh obstacles were suggested by the Franciscans, and, when Savonarola insisted that his champion should bear the host, they cried out against the sacrilege of exposing the Redeemer's body to the flames. All was turmoil and confusion, the crowd frantic. And, although Rondinelli had not come, the signory sent angry messages to ask why the Dominicans delayed the trial. Meanwhile the Arrabbiati stirred the public discontent and threw all the blame on Savonarola. Some Compagnacci assaulted the loggia in order to kill him, but were driven back by Salviati's band. The foreign soldiery, fearing an attack on the palace, charged the excited mob, and the tumult was temporarily checked. It was now late in the day, and a storm shower gave the authorities a pretext for declaring that heaven was against the ordeal. The crafty Franciscans slipped away unobserved, but Savonarola, raising the host, attempted to lead his monks across the piazza in the same solemn order as before. On this the popular fury burst forth. Defrauded of their bloody diversion, the people were wild with rage. Frà Girolamo's power was suddenly at an end. These Florentines who had worshiped him as a saint turned on him with rabid hate. Neither he nor his brethren would have lived to reach St. Mark's but for the devoted help of Salviati and his men. They were pelted, stoned, and followed with the vilest execrations. Against the real culprits, the dastardly Franciscans, no anger was felt; the zealous prior, the prophet and lawgiver of Florence, was made the popular scapegoat. Notwithstanding the anguish that must have filled his heart, the fallen man preserved his dignity and calm. Mounting his own pulpit in St. Mark's he quietly related the events of the day to the faithful assembled in the church, and then withdrew to his cell, while the mob on the square outside was clamoring for his blood.

The next morning, the signory having decreed the prior's banishment, Francesco Valori and other leading Piagnoni hurried to him to concert measures for his safety. Meanwhile the government decided on his arrest, and no sooner was this made public than the populace rushed to the attack of the convent. The doors of St. Mark were hastily secured, and Savonarola discovered that his adherents had secretly prepared arms and munitions and were ready to stand a siege. The signory sent to order all laymen to quit the cloister, and a special summons to Valori. After some hesitation the latter obeyed, hoping by his influence to rally all the Piagnoni to the rescue. But he was murdered in the street, and his palace sacked by the mob. The monks and their few remaining friends made a most desperate defense. In vain Savonarola besought them to lay down their arms. Frà Benedetto the painter and others fought like lions, while some hurled tiles on the assailants below. When the church was finally stormed Savonarola was seen praying at the altar, and Frà Domenico, armed with an enormous candlestick, guarding him from the blows of the mob. Profiting by the smoke and confusion a few disciples dragged their beloved master to the inner library and urged him to escape by the window. He hesitated, seemed about to consent, when a cowardly monk, one Malatesta Sacramoro, cried out that the shepherd should lay down his life for his flock. Thereupon Savonarola turned, bade farewell to the brethren, and, accompanied by the faithful Domenico, quietly surrendered to his enemies. Later, betrayed by the same Malatesta, Frà Silvestro was also seized. Hustled, insulted, and injured by the ferocious crowd, the prisoners were conveyed to the Palazzo Vecchio, and Savonarola was lodged in the tower cell which had once harbored Cosimo d'Medici.

Now came an exultant brief from the pope. His well-beloved Florentines were true sons of the church, but must crown their good deeds by dispatching the criminals to Rome. Sforza was equally rejoiced by the news, and the only potentate who could have perhaps saved Savonarola's life, Charles of France, had died on the day of the ordeal by fire. Thus another of the Friar's prophecies was verified, and its fulfillment cost him his sole protector.

The result of the trial was a foregone conclusion. The signory refused to send their prisoners to Rome, but they did Rome's behests. On the evening of May 22d sentence of death was pronounced on him and his two disciples.

The execution took place the next morning. By a refinement of cruelty Savonarola was the last to suffer. His disciples' bodies already dangled from the arms of the cross before he was hung on the center beam. Then the pile was fired. For a moment the wind blew the flames aside, leaving the corpses untouched. "A miracle," cried the weeping Piagnoni; but then the fire leaped up and ferocious yells of triumph rang from the mob. At dusk the martyrs' remains were collected in a cart and thrown into the Arno.

SAVOY. The history of the house of Savoy shows in a striking manner how the destinies of a nation may depend on the fortunes of a princely family. During eight centuries, and through all changes of fortune, the princes of Savoy have kept one end steadily in view, and in the words of Charles Emmanuel III., have "treated Italy as an artichoke to be eaten leaf by leaf." The ambitions of princes and the interests of the people have fortunately tended in the same direction, and their work is now perfected in the glory of their house and the freedom of the state.

The descent of HUMBERT the Whitehanded, the founder of the family, is uncertain, but he was most probably a son of Amadeus, the great-grandson of that Boso of Provence (879) who was father of the emperor Louis the Blind. In reward for services rendered to Rudolph III. of Arles, Humbert obtained from him in 1027 the counties of Savoy and Maurienne, and from the Emperor Conrad the Salic Chablais and the Lower Valais. His territories, therefore, all lay on the northwestern slopes of the Alps. On his death in 1048 he was succeeded perhaps by his eldest son AMADEUS I., but eventually by his fourth son OTHO. Otho was succeeded in 1060 by his son AMADEUS II. AMADEUS III. came to the throne in 1103, and in 1111 his states were created counties of the empire by Henry V. On his way home from the crusades in 1149 Amadeus died at Nicosia, and was succeeded by his son HUMBERT III. He was followed in 1233 by AMADEUS IV., whose wife was the beautiful Cecilia of Beaux, surnamed Passe Rose. In 1253 his son BONIFACE succeeded to his states at the age of nine, but, after giving proofs of his valor by defeating the troops of Charles of Anjou before Turin, he was taken prisoner and died of grief (1263).

The Salic law now came into operation for the first time, and PETER, the uncle of Boniface, was called to the throne.

At his death in 1268 he was succeeded by his brother PHILIP I., who died in 1285, when their nephew AMADEUS V. came to the throne. He died in 1323 while making preparations for a campaign in aid of his nephew, the emperor of the East. His son EDWARD succeeded him, and, dying in 1329, was followed by his brother AYMON. This prince died in 1343, when his son AMADUES VI. ascended the throne. Thereign of his son AMADEUS VII. promised to be as glorious as those of his ancestors, but it was cut short by a fall from his horse in 1391. His son AMADEUS VIII. now came to the throne. His son AMADEUS IX. succeeded in 1465, but though his virtues led to his beatification, his bodily sufferings made him assign the regency to his wife Yolande, a daughter of Charles VII. He died in 1472, when his son PHILIBERT I. succeeded to the throne and to his share in the contests of Yolande with her brother and brothers-in-law, who tried to deprive their nephew of his rights. His reign lasted only ten years, when he was succeeded by his brother CHARLES I. This prince raised for a time by his valor the drooping fortunes of his house, but he died in 1489 at the age of 31; having inherited from his aunt, Charlotte of Lusignano, her pretensions to the titular kingdoms of Cyprus, Jerusalem, and Armenia. He was succeeded by his son CHARLES II., an infant, who, dying in 1496, was followed by PHILIP II., brother of Amadeus IX. He died in 1497, leaving PHILIBERT II., who succeeded him, and CHARLES III., who ascended the throne of his brother's death in 1504. His only surviving son EMMANUEL PHILIBERT succeeded to the rights but not the domains of his ancestors. His son CHARLES EMMANUEL I., called the Great, being prevented by Henry III. from retaking Geneva, threw in his lot with Spain, and in 1590 invaded Provence and was received by the citizens of Aix. His intention was doubtless to revive the ancient kingdom of Arles, but his plans were frustrated by the accession of Henry IV. to the throne of France. After effecting with Henry an exchange of Bresse and Bugey for the marquisate of Saluzzo he kept up an intermittent war with him until 1609, when, disgusted with the behavior of Spain, he made a treaty with France against Philip. But he could not remain faithful for long, and, siding first with one and then with the other, he found himself in almost the same straits as his grandfather, when death put an end to his ambitions and failures in 1630. The first care of his son, VICTOR AMADEUS, was to free himself from the double burden of his enemy and his ally, so he concluded peace in 1631. He died in 1637, leaving by his wife, Christina of France, Francis Hyacinth, a minor, who only survived till the following year, and CHARLES EMMANUEL II., whose legitimacy was unfortunately rather doubtful. The regency of Christina resembled that of Yolande in the same need for guarding her son's interests against the pretensions of his uncles, Louis XIII. and the princes of Savoy. But fortune favored her, and on the duke's reaching his majority in 1648 the wars of the Fronde occupied all the attention of Mazarin. The brunt of the conflict with Spain consequently fell upon Savoy, and was borne not ingloriously until the conclusion of peace. Charles Emmanuel occupied the remaining part of his reign in repairing the ravages caused by twenty-four years of warfare, and died in 1675, leaving an only son, VICTOR AMADEUS II., whose minority was as peaceful as his father's had been the reverse. In 1730 the king abdicated in favor of his son, in order to marry the countess of San Sebastian, at whose instigation he afterward tried to regain the crown, but he died in 1732.

CHARLES EMMANUEL III. continued intrigues to obtain possession of Milan, and joined the league of France and Spain against Austria in 1732. The complete defeat of the French in 1747 led to the treaty of Aix-la-Chapelle, by which Charles Emmanuel received the Upper Novaresé and Vigevano, after which he remained at peace until his death in 1773. His son VICTOR AMADEUS III. succeeded him, and devoted the early years of his reign to the improvement of the administration and the reorganization of his army. The time soon came for him to use the weapon he had created, and on the outbreak of the Revolution in France he headed the coalition of Italian princes against her. The house of Savoy thus assumed the headship of Italy, but for the time without much gain, for Napoleon's brilliant victories of 1796 ended in the peace of Paris, by which Savoy, along with Nice, was given to France. Victor Amadeus died shortly afterward, and was succeeded by his son CHARLES EMMANUEL IV. The fever of the Revolution spread to Piedmont, and in 1798 nothing was left to the king but to retire to Sardinia. In 1802 he abdicated in favor of his brother, VICTOR EMMANUEL I., who, in his island kingdom, protected by the English fleet, became the symbol of the coalition against France. The king returned to Turin in 1814, and in the following year took possession of Savoy. The anti-revolutionary measures which were adopted by the Italian princes on their return caused a spirit of rebellion to spring up among their subjects. The freedom of the individual and the unity of the nation thus came to be considered objects to be attained at one and the same time. The influence of Austria was paramount in the Peninsula, but an insurrection broke out at Turin in 1820 demanding war with her, and, rather than embroil himself both with his people and with Austria, Victor Emmanuel abdicated in favor of his brother, CHARLES FELIX. The general insurrection was suppressed, and for the next few years Italy suffered everything possible at the hands of various petty princes, whose fears and weakness left them no weapon but persecution. In 1831 Charles Felix died without issue, and in him the elder branch of the family ended. He was succeeded by CHARLES ALBERT, of the line of Savoy-Carignano, which was founded by Thomas Francis, son of Charles Emmanuel the Great, and grandfather of Prince Eugene. The first care of Charles Albert was to reorganize his military and naval forces in readiness for the conflict with Austria, which he foresaw. At the same time he put down the conspiracies which would have forced his hand, among which the most famous was that of Mazzini and Ramorino in 1834. The French revolution of 1848 fanned the embers of Italian patriotism, and Charles Albert, without any aid, began the War of Independence. Victory at first followed his arms, but he was defeated at last by the Austrians at Custozza. In the next year he was again driven into war with the Austrians, and, after his defeat at Novara, he abdicated in favor of his son, VICTOR EMMANUEL II. From this point the history of the house of Savoy has been told in the article ITALY.

SAVOY. For the French departments of Savoy and Upper Savoy see SAVOIE and SAVOIE, HAUTE-.

SAW. See SAWS.

SÁWANTWÁRI, or SAWUNTWARRIE, a native state forming the southern part of the Concan division of the Bombay presidency, India, and lying between 15° 37′ and 16° 16′ N. latitude, and between 73° 36′ and 74° 21′ E. longitude. It has a total area of about 900 square miles, and is bounded on the north and west by Ratnagiri district, on the east by the Sahyádri Mountains, and on the south by the Portuguese territory of Goa.

The census of 1881 returned the population of Sáwantwári at 174,433. Agriculture supports the greater part of the population. The staple product is rice, but excepting rice none but the coarsest grains and pulses are raised, both soil, which is stony, and climate being against the cultivation of wheat and other superior grains; oil seeds, hemp, and pepper are also grown.

SAW-FISH. See RAY.

SAW-FLIES (*Tenthredinidæ*). This subdivision of the *Hymenoptera* is characterized by possessing a sessile abdomen which hides the base of the posterior legs. The antennæ vary in their structure and in the number of their joints. The ovipositor is modified to form two saws, which when at rest lie in a sheath formed of two valves. The larvæ resemble caterpillars, but may be distinguished by their greater number of legs; usually nine to eleven pairs are present.

The injury which the saw-flies inflict upon crops or young trees is almost entirely brought about by the voracious habits of the larvæ. These possess well developed mouth-appendages, by means of which they gnaw their way out of the leaf in which they have been hatched, and then eat it. In this way the Turnip Saw-Fly (*Athalia spinarum*), not to be confused with the Turnip Fly (*Phyllotreta nemorum*), attacks the leaves of the turnip, often completely consuming the leafage of acres at a time. The Pine Saw-Fly (*Lopyhrus pini*) causes great damage to plantations of young Scotch firs, devouring the buds, the leaves, and even the bark of the young shoots. Other species infest currant and gooseberry bushes, consuming the soft parts of the leaves, and leaving only the tough veins. The only effectual remedy in most cases is to collect and kill the larvæ when they first appear. Syringing the affected parts with hot water or tobacco water is also recommended.

SAWS. Blades of steel with serrated edges have been used from time immemorial to rend or divide substances of various kinds, including metals and stone; but the principal modern use of the saw is to divide wood. Modern saws are of the finest steel, but the ancients used bronze saws, and among uncivilized nations saws have been made with flakes of flint imbedded in a wooden blade, and held in place by means of bitumen (see Grimshaw, *History*, *etc.*, *of Saws*), while obsidian has been used by the Mexicans, and shark's teeth and even notched shells form the saws of certain savage islanders. The pyramid-builders in Egypt cut granite and other hard stones by means of bronze saws set with jewels.

Saws may be classified as (1) straight (reciprocating in action), having a flat blade and straight edge, making a plane cut, or (2) circular or disk-like, cutting at right angles to the motion, or (3) cylindrical or barrel-shaped, with a convex edge cutting parallel to its axis, or (4) band-saws, being a continuous ribbon or band running upon an upper and lower pulley, making a plane or curved cut, with a straight edge parallel to the axis of motion. The oldest and commonest, with the widest range of adaptability, is the straight saw, with reciprocating rectilinear blade. In this class is included the ordinary hand-saw with its varying range of uses from fine to coarse and from rip to cross-cut, and with teeth of forms as various as are the different duties which it is calculated to perform. The teeth are long or short, cutting one way or both ways according to the "pitch" or "set" which may be given, and which should be adapted to both the kind and character of the timber to be sawn. The "pitch" of a saw-tooth is the angle of the point with reference to the blade, and is found by subtracting the back angle from the front, 60° being the generic angle of saw-teeth, which, however, may be variously placed. From the smallest hand-saw to the largest "mill-saw" the same general rules apply. In the largest saws of this class may be named the "pit-saw," used in the earliest manufactures of lumber or timber, and worked by one person standing over the log and drawing upward while another in the pit below follows with the downward or cutting thrust. From the pit-saw we advance to the "gate-saw," used in the earlier adaptation of motive power to the cutting of timber, thence to the "muley-saw," suspended without strain upon a pitman beneath, having its upper end hung in slides pendent from a heavy beam above. These saws must of necessity be thick, to sustain the heavy thrusts which they are expected to endure, and are consequently of "heavy gauge," this being based upon the different sizes of wire, the largest gauge representing the thinner blade; *e.g.*, a four-gauge saw is much thicker than an eight-gauge, etc. From the necessity for more rapid production grew the "gang-saw," a modification of the gate, differing from it only in length and thickness (less than one-third the thickness of the ordinary gate-saw and but about two-thirds its length). A large number of these, varying from two to forty, are strained in a gate or frame, at such distances apart as the thickness of lumber demands, and the log is wholly made into boards in one operation. Of the reciprocating class of saws is the "cross-cut," used for cutting across the grain of the timber or wood to be converted into shorter lengths. The length, breadth, "pitch," and "set" of saws vary according to the use which is to be made of them and the kind of timber which is to be manipulated. In a cross-cut saw the cutting edge strikes the fiber at right angles to its length, and while its pitch is but slight (if any) it must sever from each side before dislodging the sawdust. "A slitting or ripping saw has the cutting edge about at a right angle to the fiber of the wood, severing it in one piece—the throat of the tooth wedging out the piece." In slitting saws the "rake" is all in front, in the cross-cut on the side.

The circular saw is of comparatively recent origin, its introduction dating from 1790, when Brunel first announced the principle. At first only circular saws of small diameter were used; but from the small "buzz-saw" of the watchmaker and fine metal worker, or the ripping saw of the planing-mill or carpenter shop, where small diameters have to be divided, the circular saw has passed to the saw-mill, where, in diameters of from twelve to thirty inches, it is the needful instrument for edging or ripping the lumber which drops from the log in an imperfect condition, requiring finer manipulation to prepare it for market; or in diameters of from forty to eighty-four inches it may be found as the main saw of the mill for rending the logs as they come from the forest into shapes and sizes adapted for the various purposes of the builder. It is capable of dividing logs into boards one inch thick or upward at as high a rate as 60,000 superficial feet in a day of twelve hours, while a straight (muley or gate) saw would give only 5,000 to 8,000 feet. In the chief lumber sections of the United States saws sixty inches in diameter are in most common use; upon the Pacific coast saws of eight feet diameter are not unknown. Attempts to work large circular saws in nests or gangs have not hitherto proved successful, but three, four, or five saws of thirty inches diameter hung on a single shaft or "arbor" may be used to trim and divide the boards or planks thrown off from a log.

Barrel saws for the manufacture of staves for barrels, pails, or tubs, are in the form of a straight-sided barrel with both heads removed, and the stave ends of one head serrated.

For the manufacture of veneers, where valuable timber is to be economically manipulated, we have the segment-saw, constructed by bolting segments of saw-blades upon the outer rim of a cast-iron center, forming a circular saw of the desired diameter, but with a cutting edge of so light a gauge as to waste but little of the valuable timber to be sawed, the cast-iron center insuring the requisite stiffness and strength. With these saws veneers scarcely thicker than a sheet of paper may be cut, the width being according to the size of the log; such saws are often from 80 to 100 inches in diameter.

Circular saws of the larger size are often constructed with "inserted" teeth. A disk of steel of suitable size, having slots cut in its periphery of the exact size and shape of the tooth which is to be inserted, may have these teeth removed as often as the wear upon them may require, without reducing the diameter of the plate. The teeth of lumber-saws have to be sharpened with the file at least three or four times in twelve hours' work, and a saw of four or five feet in diameter is rapidly reduced in size with a great loss of efficiency. In the insert-tooth plate new teeth cost only about three cents each, and the saw-plate remains of its original diameter. Inserted teeth are of various forms and shapes, from that of the ordinary saw tooth, held in place by a rivet at the root of the tooth, to a "chisel-point" held by an ingenious system of wedging.

Band-saws have for many years been used for continuous and rapid cutting in the planing-mill or other wood-working establishment, where scrolls or fancy lines and curves were to be followed, requiring great flexibility of the saw-blade. Of late, and notably within the past six years (1884–90), successful endeavors have been made to adapt them to lumber manufacture. The band-saw is a continuous blade or ribbon running over pulleys above and below, forming a "steel belt" whose serrated edge is always "in the cut." These saws are usually from a half-inch in width (for shop-work) to six and eight inches wide for the heavier work of the saw-mill, and in the latter have a cutting capacity of from 30,000 to 40,000 superficial feet in twelve hours. They are extremely thin (usually sixteen-gauge), and the kerf produced is so much less than that of the upright or the circular that a saving of at least 20 per cent. of timber is claimed in their use.

Saws used by surgeons, butchers, and in all branches of manufacture are but modifications of one of the varieties above described, and do not demand more extended description.

Saw-Mills are factories for the conversion of forest trees into lumber and timber. The earliest form of saw-mill was unquestionably the saw-pit, still found in a modified form in shipbuilders' yards, the log being raised on trestle horses instead of one of the sawyers being sunk in the pit. Saws were run by windmill-power as early as the thirteenth century; and the use of water-power soon followed. The vast majority of the saw-mills in the United States are now run by steam-power. The primitive water saw-mill consisted of a wooden pitman attached to the shaft of the water-wheel, the log to be sawed being placed on rollers sustained by a framework over the wheel, and being fed forward on the rollers by means of levers worked by hand. Good authorities mention saw-mills running by water-power in Germany as early as 1322. In 1663 an attempt to establish a mill in England was abandoned owing to the opposition of the sawyers, and no further attempt was made till 1768, when a mill was erected at Limehouse, but was soon destroyed by a mob. North America, with its vast forests, may be aptly termed the home of saw-mills. As early as 1634 a saw-mill was erected at the falls of the Piscataqua, near the line dividing Maine from New Hampshire. This was no doubt the pioneer of the vast array of mills which subsequently made Maine famous as a lumber-producing State for many years. From about the same date several mills were erected along the Atlantic coast of America, a description of one being that of all. In these mills the saw was attached by a long pitman from the wheel shaft to a ponderous gate, running in wooden slides upon two heavy posts, crossed above by a beam connecting the two sides of the mill frame. The mill-carriage on which the log lay was pushed toward the saw by a rack and pinion, etc., moved by a feed-wheel. The daily capacity of these mills was from 500 to 1,500 superficial feet. The first great improvement upon this class of mills was in the introduction of two or more saws to the gate, the general character of the methods remaining the same. With the demand for more rapid production came improvements in the "gang" feature, and the wonder of the age was the "Yankee gang," so arranged, by placing half the saws facing in one direction and the other half in the opposite, that two logs were worked up in one movement of the carriage, or, as in the "slabbing" gang, the outsides or slabs were cut from one log, which was then turned upon its flattened sides to the other set of saws which cut it into boards. The "stock" gang, "pony" gang, "slabbing" gang, and "Yankee" gang are favorites with saw-mill proprietors, because of the uniform character of the lumber produced, and the saving of timber realized from the use of saws of scarcely one-third the thickness of the gate, muley, or circular.

Shingle Mills.—A standard shingle is four inches wide, and all computations of quantity are based upon that width, although the individual shingle may be six or eight inches wide or as much as eighteen inches, in the latter case counting four and one-half shingles. A shingle mill differs from a saw-mill in the adaptations of machinery. Saws of sixteen-gauge, forty inches in diameter, are most commonly employed.

SAXE, Maurice, Comte de, marshal of France, was the natural son of Augustus II. of Saxony and the countess Aurora of Königsmark. An entry in the parish registers of Goslar shows that he was born in that town, October 28, 1696. As he grew up to manhood he was seen to bear a strong resemblance to his father, in both person and character. His grasp was so powerful that he could bend a horse-shoe with his hand, and to the last his energy and endurance were unsubdued by the severe bodily illnesses resulting from his many excesses. On the outbreak of the war in 1734 he served under Marshal Berwick, and for a brilliant exploit at the siege at Philippsburg he was in August named lieutenant-general. It was, however, with the opening of the Austrian Succession War in 1741 that he first rose into prominence. Having on January 12, 1747, been made marshal-general, he in the following campaign won the victory of Lawfeldt over the duke of Cumberland, and on September 16th he stormed Bergen-opzoom. In May, 1748, he captured Maestricht after a month's siege. After the peace, he lived in broken health, chiefly at Chamford, and he died there November 30, 1750.

SAXE-ALTENBURG (Germ. *Sachsen-Altenburg*), a duchy in Thuringia, and an independent member of the German empire, consists of two detached and almost equal parts, separated from each other by a portion of the Reuss (junior line), and bounded on the south and west by the grand duchy of Saxe-Weimar-Eisenach, on the north by Prussia, and on the east by the kingdom of Saxony. There are in addition twelve small exclaves. The total area is 510 square miles. The chief seats of trade and manufacture are Altenburg, the capital (29,422 inhabitants in 1885), Ronneburg (5,485 inhabitants in 1880), Schmölln (6,394), Gössnitz (4,949), and Meuselwitz (3,402) in the Altenburg division; and Eisenburg (6,277), Roda (3,465), and Kahla (2,999) in the Saal-Eisenburg division. Besides these there are the towns of Lucka (1,505) and Orlamünde (1,461), and 449 villages, of which Russdorf (1,781), in an exclave, is the largest.

In 1880 the population was 155,036, or 304 per square mile.

SAXE-COBURG-GOTHA (Germ. *Sachsen-Koburg-Gotha*), a duchy in Thuringia, and an independent member of the German empire, consists of two formerly separate duchies of Coburg and Gotha, which lie at a distance of fourteen miles from each other, and of eight small scattered exclaves, the most northerly of which is seventy miles from the most southerly. The total area is 760 square miles (about two square miles more than the county of Surrey in England), of which 217 are in Coburg and 543 in Gotha.

The population in 1880 was 194,716 or about 256 per square mile, of whom 56,728 (261 per square mile) were in Coburg and 137,988 (254 per square mile) in Gotha. In the former duchy the people belong to the Franconian and in the latter to the Thuringian branch of the Teutonic family.

SAXE-MEININGEN (Germ. *Sachsen-Meiningen*), a duchy in Thuringia, and an independent member of the German empire, consists chiefly of an irregular crescent-shaped territory, which, with an average breadth of ten miles, stretches for over eighty miles along the southwest slope of the Thuringian Forest. The convex side rests upon the duchy of Coburg, and is in a part bounded by Bavaria, while the concave side, turned toward the north, contains portions of four other Thuringian states and Prussia between its horns, which are forty-six miles apart. The soil is not very productive, although agriculture flourishes in the valleys and on the level ground; grain has to be imported to meet the demand.

The capital of the duchy is Meiningen (in 1881, 11,227 inhabitants). Of the sixteen other towns (Salzungen, Wasungen, Hildburghausen, Eisfeld, Sonneberg, Saalfeld, Pössneck, Kamburg, etc.) none has so many as 10,000 inhabitants. There are 392 villages and hamlets. In 1880 the population was 207,075 (217 per square mile).

SAXE-WEIMAR-EISENACH (Germ. *Sachsen-Weimar-Eisenach*), the largest of the Thuringian states, is a grand-duchy and a member of the German empire. It consists of the three chief detached districts of Weimar, Eisenach, and Neustadt, and twenty-four scattered exclaves, of which Allstedt, Oldisleben, and Ilmenau belonging to Weimar, and Ostheim belonging to Eisenach, are the chief. The first and last named of these exclaves are seventy miles apart; and the most easterly of the other exclaves is 100 miles from the most westerly. The total area of the grand-duchy is 1,387 square miles (or slightly larger than Wiltshire in England), of which 678 are in Weimar, 465 in Eisenach, and 244 in Neustadt.

Agriculture forms the chief occupation of the inhabitants in all parts of the duchy, though in Eisenach and Ilmenau a large proportion of the area is covered with forests.

The manufacturing industries in the grand-duchy are considerable; they employ 37.3 per cent. of the population. The most important is the textile industry, which centers in Apolda, and employs more than 20,000 hands throughout the country. The production of woolen goods (stockings, cloth, underclothing) forms the leading branch of the industry; but cotton and linen weaving and yarn-spinning are also carried on. Large quantities of earthenware and crockery are made, especially at Ilmenau. The microscopes of Jena, the scientific instruments (thermometers, barometers, etc.) of Ilmenau, and the pipes and cigar-holders of Ruhla (partly in Gotha) are well known. Leather, paper, glass, cork, and tobacco are among the less prominent manufactures. There are numerous breweries in the duchy. The volume of trade is not very great, although some of the productions (chiefly those first mentioned) are exported all over Europe, and in some cases to other continents as well. The chief imports, besides colonial goods, are wool for the manufactures, hides, coal, meerschaum (from Smyrna and Vienna), amber, horn, etc. Eisenach and Weimar are the chief seats of trade.

The population in 1880 was 309,577, or 223 per square mile.

SAXIFRAGE (*Saxifrāga*), a genus of plants which gives its name to the order of which it is a member. There are nearly 200 species distributed in the temperate and arctic parts of the northern hemisphere, frequently at considerable heights on the mountains. Many species are in cultivation, including the Bergenias or Megaseas with their large fleshy leaves and copious panicles of rosy or pink flowers, the numerous alpine species, such as *S. pyramidalis*, *S. Cotyledon*, etc., with tall panicles studded with white flowers, and many others.

SAXO GRAMMATICUS, the celebrated Danish historian and poet, belonged to a family of warriors, his father and grandfather having served under king Valdemar I., who died in 1182. He himself was brought up for the clerical profession, entered about 1180 the service of Archbishop Absalon as one of his secretaries, and remained with him in that capacity until the death of Absalon in 1201. At the instigation of the latter he began, about 1185, to write the history of the Danish Christian kings from the time of Sven Estridsön, but later Absalon prevailed on him to write also the history of the earlier heathen times, and to combine both in a great work, *Gesta Danorum*. Saxo, from his apprenticeship as the archbishop's secretary, had acquired a brilliant but somewhat uphuistic Latin style, and wrote fine Latin verses, but otherwise does not seem to have had any very great learning or extensive reading. His models of style were Valerius Maximus, Justin, and Martianus Capella, especially the last.

SAXON DUCHIES. For the four Saxon duchies, SAXE-ALTENBURG, SAXE-COBURG-GOTHA, SAXE-MEININGEN, and SAXE-WEIMAR-EISENACH, see those headings.

SAXONS, LAW OF THE. See SALIC LAW.

SAXONY is the name successively given in German history to a mediæval duchy in northern Germany, to a later electorate which afterward became the present kingdom of Saxony (described below), and to a ducal province of Prussia. The last was formed directly out of part of the second in 1815, but the connection between the first and second, as will be seen from the present article, is neither local nor ethnographical, but political.

The Saxons (Lat. *Saxones*, Ger. *Sachsen*), a tribe of the Teutonic stock, are first mentioned by Ptolemy as occupying the southern part of the Cimbrian peninsula between the Elbe, Eider, and Trave, the district now known as Holstein. The name is most commonly derived from "sahs," a short knife, though some authorities explain it as meaning "settled," in contrast to the Suevi or "wandering" people. By the end of the third century, when we hear of a "Saxon Confederation" embracing the Cherusci, Chauci, and Angrivarii, and perhaps corresponding to the group of tribes called Ingævones by Tacitus, the chief seat of the nation had been transferred south of the Elbe to the lands on both sides of the Weser now occupied by Oldenburg and Hanover. The Saxons were one of the most warlike and adventurous of the Teutonic peoples.

In 772 Charlemagne, induced partly by a desire to protect his kingdom from the incursions of hostile neighbors and partly by a proselytizing spirit, began the subjugation of the Saxons. The war, waged on both sides with the utmost ferocity, lasted, in a series of campaigns with but brief intervals, for thirty-one years. The Saxons were hostile to the Franconian emperors who succeeded the Saxon house (which began with Henry the Fowler in 919 and ended with Henry II. in 1024), and in 1073 they rose in revolt against Henry IV. They were at first successful, but in 1075, at the battle of Langensalza, they were defeated by the emperor. The rebels were severely punished, though Otto of Nordheim, one of their leaders, was made administrator of the duchy. Taking advantage of Henry IV.'s troubles with the pope, they again rebelled and espoused the cause of Rudolf of Swabia; but in 1087, on the resignation of Hermann of Luxemburg, whom they had chosen king, they made peace once more with the emperor. The emperor Henry V. now (1106) presented the lapsed duchy to Lothair, count of Supplinburg, who rapidly became the most powerful prince in Germany, and in 1125 was placed on the imperial throne by the influence of the papal party. Two years after his elevation he assigned the duchy of Saxony to his powerful son-in-law Henry the Proud, who was already duke of Bavaria and had inherited the private possessions of the Billings in Saxony, in right of his mother, who was a daughter of Magnus. Henry had aspired to be emperor in 1138, and his successful rival Conrad III., wishing to reduce his power, alleged that it was unlawful for one prince to hold two duchies, and ordered him to resign Saxony. On his refusal, the emperor immediately declared both duchies to be forfeited. Henry died before the ensuing war was ended, and Conrad compromised matters by appointing his opponent's young son, afterward known as Henry the Lion, to the duchy of Saxony, compensating Albert the Bear, the former imperial candidate, with the independence of the North Mark of Saxony. In 1155 Henry received Bavaria from his cousin and personal friend the emperor Frederick Barbarossa, and thus became second only to the emperor in power. He added considerably to the extent of Saxony by conquest among the Wends, east of the Elbe, where the boundary had always been a fluctuating one. But Henry was not only powerful, he was also arrogant, and incurred the jealousy of the other princes, so that, when he quarreled with the emperor and his lands were declared forfeited in 1180, he had no allies to assist him in his resistance. Westphalia, the principal part of Saxony, went to the archbishop of Cologne, the Saxon Palatinate to the landgrave of Thuringia, and other portions to other princes. A small district round Lauenburg, north of the Elbe, was assigned with the title of duke of Saxony to Bernhard of Ascania, son of Albert the Bear. Henry was reduced to submission in 1181; but his duchies could not be restored, and he was forced to content himself with Brunswick and Lüneburg. The duchy of Saxony was never restored in the old sense, in which it had been one of the four principal duchies of the empire, and embraced the territories now occupied by Westphalia, Oldenburg, Hanover, the Harz, and parts of Mecklenburg and Holstein. The new creation never rose to any importance. Bernhard of Ascania (1181–1212), before his accession as duke of Saxony, had held Anhalt and Wittenberg, to the southeast of Saxony, and separated from it by the Mark of Brandenburg; and when his grandsons John and Albert II. divided their inheritance in 1260 the latter placed his seat at Wittenberg, and two tiny duchies arose—Saxe-Lauenburg and Saxe-Wittenberg. Saxe-Lauenburg was now the only part of the great duchy which retained the name; while Saxe-Wittenberg, the nucleus of the later electorate, transferred the name to entirely new soil. Both duchies claimed the electoral privileges, including the office of grand marshal (Erzmarschall), which had belonged to the original duke of Saxony, but the Golden Bull of 1356 confirmed the claims of Wittenberg. Rudolph II. (about 1370) is the first duke who formally styles himself elector (*princeps elector*). The small electorate was made still smaller in 1411 by the formation of Anhalt into a separate principality. In 1422 the Ascanian line became extinct with Albert III., and in 1423 the emperor Sigismund conferred their lands and titles upon Frederick, margrave of Meissen, and landgrave of Thuringia, to whom he was deeply indebted for both money and assistance in the Hussite wars. The new and more honorable style of elector of Saxony superseded Frederick's other titles, and the term Saxony gradually spread over all his other possessions, which included the country now known under that name. The early history of the electorate and kingdom of Saxony is thus the early history of the Mark of Meissen, the name of which now lingers only in a solitary town on the Elbe.

Frederick's new dignities as elector, combined with his personal qualities, now made him one of the most powerful princes in Germany; had the principle of primogeniture been established in the country as he left it, Saxony and not Brandenburg might have been the leading power in the empire to-day. He died in 1428, just in time to escape the grief of seeing his lands cruelly ravaged by the Hussites in 1429 and 1430. The division of territory between his two sons, Frederick the Mild (1428–1464) and William, once more called forth destructive internecine wars (the "Brüderkrieg"), in which the former for a time forgot his surname. It was in 1455, during this war, that the knight Kunz von Kaufungen carried into execution his bold, though only momentarily successful, plan of stealing two young sons of the elector Frederick. Ernest and Albert, the two princes in question, succeeded to their father's possessions in 1464, and for twenty years ruled peacefully in common. The land rapidly prospered during this respite from war. Trade made great advances, encouraged by an improved coinage, which was one of the consequences of the silver discoveries on the Schneeberg. Several of the powerful ecclesiastical principalities were at this time held by members of the Saxon electoral house so that the external influence of the electorate corresponded to its internal prosperity. Matters were not suffered to continue thus. The childless death of their uncle William in 1482 bequeathed Thuringia to the two princes, and the younger Albert insisted upon a division of the common possessions. In August, 1485, the partition of Leipsic took place, which resulted in the foundation of two Saxon lines, the Ernestine and the Albertine. The lands were never again united. Ernest divided the lands into two portions, and Albert chose. Apart from the electoral duchy of Wittenberg, which necessarily went to Ernest as the elder brother, the lands were divided into Thuringia, half of the Osterland, and Naumburg and the Voitland on the one hand, and Meissen and the remaining parts of eastern Saxony on the other. To Ernest's deep chagrin, Albert chose Meissen, the old ancestral lands of Wettins. The former only survived his vexation a year.

The electorate remained at first with the Ernestine line. Ernest was succeeded by his son Frederick the Wise (1486–1525), one of the most illustrious princes in German history. Under his rule Saxony was perhaps the most influential member of the German empire; and on the death of Maximilian the imperial crown itself was offered to him, but he vindicated his character by refusing it. In this reign Saxony became a cradle of the Reformation.

The Albertine Maurice became elector after the capitulation of Wittenberg. He was the grandson of the founder of his house, and had been preceded on the throne of Meissen by his uncle George (1500–1539) and by his father Henry (1539–1541). George was a zealous Roman Catholic, and had vainly endeavored to stem the Reformation in his dominions; Henry was an equally devoted Protestant. Maurice (1541–1543) was also a Protestant, but he was too astute to permit his religion to blind him to his political interests. His ruling motive seems to have been ambition to increase his personal power and the consequence of his country. Augustus I. (1553–1586), brother of Maurice, was one of the best domestic rulers that Saxony ever had. He increased the area of the country by the "circles" of Neustädt and the Voigtland, and by parts of Henneberg and the silver-yielding Mansfield, and he devoted his long reign to the development of its resources. Under his son Christian I. (1586–1591) the chief power was wielded by the chancellor Crell, who strongly favored Calvinism, but, when Christian II. (1591–1611) came to the throne a mere child, Crell was sacrificed to the Lutheran nobles. The duke of Weimar was made regent, and continued the persecution of crypto-Calvinism, in spite of the breach with the Reformed imperial diet which this course involved. Christian II. was succeeded by his brother John George I. (1611–1656), under whom the country was devastated by the Thirty Years' War. No other country in Germany was so terribly scourged by this terrible war. Immense tracts were rendered absolutely desolate, and whole villages vanished from the map; the people were tortured to reveal their treasures, or from wanton brutality; famine was followed by plague; civilization was thrown back and barbarism revived. In eight years the population sank from three to one and a half millions. When the war was at length ended by the peace of Westphalia in 1648, Saxony found that its influence had begun to decline in Germany. The next three electors, who each bore the name of John George, had uneventful reigns. The first made some efforts to heal the wounds of his country; the second wasted the lives of his people in foreign wars against the Turks; and the third was the last Protestant elector of Saxony. John George IV. was succeeded by his brother Frederick Augustus I., or Augustus the Strong (1694–1733). This prince was elected king of Poland as Augustus II. in 1697.

The wars and extravagance of the elector-king, who regained the Polish crown in 1709, are said to have cost Saxony 100,000,000 thalers. Frederick Augustus II. (1733–1763), who succeeded his father in the electorate, and was afterward elected to the throne of Poland as Augustus III., was an indolent prince, wholly under the influence of Graf von Brühl. Under his ill-omened auspices Saxony sided with Prussia in the First Silesian War, and with Austria in the other two. It gained nothing in the first, lost much in the second, and in the third, the Seven Years' War (1756–1763), again became the scene of war and suffered renewed miseries. The country was deserted by its king and his minister, who retired to Poland. By the end of the war it had lost 90,000 men and 100,000,000 thalers; its coinage was debased and its trade ruined; and the whole country was in a state of frantic disorder. The elector's son and successor, Frederick Christian, survived his father only two months, leaving a son, Frederick Augustus III. (1763–1827), a boy of thirteen. Prince Xaver, the elector's uncle, was appointed guardian, and he set himself to the sorely-needed work of healing the wounds of the country. Frederick assumed the government in 1768, and in his long and eventful reign, which saw the electorate elevated to the dignity of a kingdom, though deprived of more than half its area, he won the surname of the Just. As he was the first king of Saxony, he is usually styled Frederick Augustus I. The year 1792 saw the beginning of the great struggle between France and Germany. Frederick's conduct throughout was perhaps more pusillanimous than self-seeking, but it entailed its own punishment. His first policy was one of selfish abstention, and from 1793 until 1796, when he concluded a definite treaty of neutrality with France, he limited his contribution to the war to the bare contingent due from him as a prince of the empire. When war broke out in 1806 against Napoleon, 22,000 Saxon troops shared the defeat of the Prussians at Jena, but the elector immediately afterward snatched at Napoleon's offer of neutrality, and abandoned his former ally. At the peace of Posen (December 11, 1806) Frederick entered the Confederation of the Rhine, assuming the title of king of Saxony, and promising a contingent of 20,000 men to Napoleon.

No change followed in the internal affairs of the new kingdom, except that Roman Catholics were admitted to equal privileges with Protestants. Its foreign policy was dictated by the will of Napoleon, of whose irresistibility the king was too easily convinced. In 1807 his submission was rewarded with the duchy of Warsaw and the district of Cottbus, though he had to surrender some of his former territory to the new kingdom of Westphalia. The king of Saxony's faith in Napoleon was momentarily shaken by the disasters of the Russian campaign, in which 21,000 Saxon troops had shared, and in 1813 he began to lean toward an alliance with Austria. Napoleon's victory at Lützen (May 2, 1813), however, suddenly restored all his awe for that great general, and the Saxon king and the Saxon army were once more at the disposal of the French. After the battle of Bautzen, Napoleon's headquarters were successively at Dresden and Leipsic. During the decisive battle at the latter town in October, 1813, the popular Saxon feeling was displayed by the desertion of the Saxon troops to the side of the allies. Frederick was taken prisoner in Leipsic, and the government of his kingdom was assumed for a year by the Russians, who promptly turned its resources against its late French ally. Saxony was now regarded as a conquered country.

Nothing but Austria's vehement desire to keep a powerful neighbor at a distance from her boundaries, preserved it from being completely annexed by the Prussians, who had succeeded the Russians in the government. As it was, the congress of Vienna assigned the northern portion, consisting of 7,800 square miles, with 864,404 inhabitants, to Prussia, leaving 5,790 square miles, with a population of 1,182,744, to Frederick, who was permitted to retain his royal title. He was forced to acquiesce in the dismemberment of his kingdom, and to console himself with the reflection that his share, though the smaller half, was richer, more populous, and more beautiful than the other.

From the partition in 1815 to the war of 1866 the history of Saxony is mainly a narrative of the slow growth of constitutionalism and popular liberty within its limits. Its influence on the general history of Europe ceased when the old German empire was dissolved. In the new empire it is too completely overshadowed by Prussia to have any objective importance by itself. When war was declared between Prussia and Austria in 1866, Saxony declined the former's offer of neutrality, and when a Prussian force crossed the border, the Saxon army under the king and the crown prince joined the Austrians in Bohemia. The entire kingdom, with the solitary exception of the Königstein, was occupied by the Prussians. On the conclusion of peace Saxony lost no territory, but had to pay a war indemnity of 10,000,000 thalers, and was compelled to enter the North-German Confederation. Its army and its postal and telegraph system were placed under the control of Prussia, and its representation at foreign courts was intrusted to the Prussian embassies. Beust was forced to resign; and liberal measures in both church and state were actively carried through. John was succeeded in 1873 by his elder son Albert (born 1828), who had won distinction as a general in the wars of 1866 and 1870. Under this prince the general course of politics has presented nothing of special importance, except perhaps the steady spread of the doctrines of social democracy, which has flourished especially in Saxony. As a loyal member of the new German empire, Saxony has gradually transferred its sympathies from its old ally Austria to its new leader Prussia. In 1877 Leipsic was chosen as the seat of the supreme court of law for the empire.

Soil.—Saxony is one of the most fertile parts of Germany; and in regard to the productive occupation of its soil it stands among the most advanced nations of the world. Only one per cent. of the total area is waste or unused. Cattle-rearing, which has been an industry since the advent of the Wends in the sixth century, has attained very considerable importance on the extensive pastures of the Erzgebirge and in the Voigtland. Sheep-farming has considerably declined within the last few decades, as in most parts of northern Germany.

The forests of Saxony are extensive, and have long been well cared for both by government and by private proprietors. The famous school of forestry at Tharandt was founded in 1811. The Voigtland is the most densely wooded portion of the kingdom, and next comes the Erzgebirge.

The mineral wealth of Saxony is very considerable; and its mines are among the oldest in Germany. Silver was raised in the twelfth century, and argentiferous lead is still the most valuable ore mined; tin, iron, and cobalt rank next; and coal is one of the chief exports. Copper, zinc, and bismuth are also worked. Saxon mines now produce about 6 per cent. of the gross quantity, and about 8 per cent. of the aggregate value of metals raised in Germany.

The Central-European position of Saxony has fostered its commerce; and its manufactures have been encouraged by the abundant water-power throughout the kingdom. Nearly one-half of the motive power used in Saxon factories is supplied by the streams, of which the Mulde, in this respect, is the chief. The early foundation of the Leipsic fairs, and the enlightened policy of the rulers of the country, have also done much to develop its commercial and industrial resources. Next to agriculture, which supports about 20 per cent. of the population, by far the most important industry is the textile. Saxony carries on 26 per cent. of the whole textile industry in Germany, a share far in excess of its proportionate population. Prussia, which has more than nine times as many inhabitants, carries on 45 per cent., and no other state more than 8 per cent. Nearly 18½ per cent. of the population were engaged in this industry in 1882, by far the largest proportion of any German state except Reuss (älterer Linie), which had 36 per cent. so engaged. The chief seats of the manufacture are Zwickau, Chemnitz, Glauchau, Meerane, and Hohenstein in the south of Zwickau, and Camenz, Pulsnitz, and Bischofswerda in the north of Dresden. The center of the cotton manufacture (especially of cotton hosiery) is Chemnitz; cotton muslins are made throughout the Voigtland, ribbons at Pulsnitz and its neighborhood. Woolen cloth and buckskin are woven at Camenz, Bischofswerda, and Grossenhain, all in the northeast, woolen and half-woolen underclothing at Chemnitz, Glauchau, Meerane, and Reichenbach; while Bautzen and Limbach produce woolen stockings. Linen is manufactured chiefly in the mountains of Lusatia, where the looms are still to some extent found in the homes of the weavers. The coarser kinds only are now made, owing to the keen English competition in the finer varieties. Damask is produced at Gross-Schönau and Neu-Schönau. Lace-making, discovered or introduced by Barbara Uttman in the latter half of the sixteenth century, and now fostered by government schools, has long been an important domestic industry among the villages of the Erz Mountains. Straw-plaiting occupies 6,000 hands on the mountain slopes between Gottleuba and Lockwitz. Waxcloth is manufactured at Leipsic, and artificial flowers at Leipsic and Dresden. Stoneware and earthenware are made at Chemnitz, Zwickau, Bautzen, and Meissen, porcelain ("Dresden china") at Meissen, chemicals in and near Leipsic. Döbeln, Werdau, and Lossnitz are the chief seats of the Saxon leather trade; cigars are very extensively made in the town and district of Leipsic, and hats and pianofortes at Leipsic, Dresden, and Chemnitz. Paper is made chiefly in the west of the kingdom, but does not keep pace with the demand. Machinery of all kinds is produced, from the sewing, machines of Dresden to the steam-locomotives and marine-engines of Chemnitz. The last-named place, though the center of the iron-manufacture of Saxony, has to import every pound of iron by railway. The leading branch is the machinery used in the industries of the country—mining, paper-making, and weaving. The very large printing trade of Leipsic encourages the manufacture of printing-presses in that city. There are no canals in Saxony, and the only navigable river is the Elbe. In 1880 the population of Saxony was 2,972,805, or 6½ per cent. of the total population of the German empire, on 2.7 per cent. of its area.

SAXONY, PRUSSIAN (Germ. *Provinz Sachsen*), one of the central provinces of the kingdom of Prussia, consists mainly of what was formerly the northern part of the kingdom of Saxony (ceded to Prussia in 1815), but also comprises the duchy of Magdeburg, the Altmark, and other districts, the connection of which with Prussia is of earlier date. The area of the province is 9,750 square miles. On the west it is bounded by Hesse-Nassau, Hanover, and Brunswick, on the north by Hanover and Brandenburg, on the east by Brandenburg and Silesia, and on the south by the kingdom of Saxony and the small Thuringian states.

The population of the province of Saxony in 1880 was 2,312,007, including 2,154,663 Protestants, 145,518 Roman Catholics, and 6,700 Jews; in 1885, according to provisional census returns, the population was 2,427,968. The great bulk of the inhabitants are of unmixed German stock, but many of those in the east part of the province have Wendish blood in their veins.

Prussian Saxony is divided into the three government districts of Magdeburg, Merseburg and Erfurt. Magdeburg is the most important town and the headquarters of an army corps, but the provincial chambers meet at Merseburg. The province sends twenty members to the reichstag and thirty-eight to the Prussian house of representatives. The religious control of the district is in the hands of a consistory at Magdeburg; the Roman Catholics belong to the diocese of Paderborn. The university of Halle holds a high rank among German seats of learning, and the other educational requirements of the province are adequately provided for.

SAY, Jean Baptiste, an eminent French political economist, was born at Lyons January 5, 1767. His first literary attempt was a pamphlet on the liberty of the press, published in 1789. He worked under the celebrated Mirabeau on the *Courrier de Provence*. In 1792 he took part as a volunteer in the campaign of Champagne.

In 1803 appeared his principal work, the *Traité d' Économie Politique*. In 1831 he was made professor of political economy at the Collége de France. He published in 1828–30 his *Cours Complet d' Économie Politique pratique*, which is in the main an expansion of the *Traité*, with practical applications. In his later years he became subject to attacks of nervous apoplexy, which increasingly reduced his strength. He lost his wife, to whom he was fondly attached, in January, 1830; and from that time his health constantly declined. When the revolution of that year broke out, he was named a member of the council-general of the department of the Seine, but found it necessary to resign that position. He died at Paris November 16, 1832, leaving behind him a well-earned reputation for private worth and political integrity.

SCALA NOVA, or Scala Nuova, or (Turkish) Kushádassi, also known as new Ephesus, a harbor on the west coast of Asia Minor, in the vilayet of Aidin, opposite the island of Samos. Before the opening of the Smyrna-Aidin railway its excellent roadstead was largely frequented by vessels trading with the Anatolian coast, and it has often been proposed to connect it with this system by a branch line, and thus enable it to compete with Smyrna as a trading center. The population is estimated at 7,000 to 10,000, of whom about 3,000 are Greeks.

SCALIGER. For some account of the great Della Scala (Lat. *Scaliger*) family, the reader is referred to the article Verona. The name has also been borne by two scholars of extraordinary eminence in the world of letters.

1. Julius Cæsar Scaliger, so distinguished by his learning and talents that, according to De Thou, no one of the ancients could be placed above him, and the age in which he lived could not show his equal, was, according to his own account, a scion of the illustrious house of La Scala, for a hundred and fifty years princes of Verona, and was born in 1484, at the castle of La Rocca on the Lago de Garda.

In 1531 he printed his first oration against Erasmus, in defense of Cicero and the Ciceronians. It is a piece of vigorous invective, displaying, like all his subsequent writings, an astonishing knowledge and command of the Latin language, and much brilliant rhetoric, but full of vulgar abuse, and completely missing the point of the *Ciceronianus* of Erasmus. The writer's indignation at finding it treated with silent contempt by the great scholar, who thought it was the work of a personal enemy—Aleander—caused him to write a second oration, more violent, more abusive, with more self-glorification, but with less real merit than the first. The orations were followed by a prodigious quantity of Latin verse, which appeared in successive volumes in 1533, 1534, 1539, 1546, and 1574.

But it is as a philosopher and a man of science that J. C. Scaliger ought to be judged. His tastes were for metaphysics and physics rather than for literature. His scientific writings are all in the form of commentaries, and it was not until his seventieth year that (with the exception of a brief tract on the *De Insomniis* of Hippocrates) he felt that any of them were sufficiently complete to be given to the world. In 1556 he printed his *Dialogue* on the *De Plantis* attributed to Aristotle, and in 1557 his *Exercitationes* on the work of Cardan, *De Subtilitate*. His other scientific works, *Commentaries* on Theophrastus' *History of Plants* and Aristotle's *History of Animals*, he left in a more or less unfinished state, and they were not printed until after his death. They are all marked by the same characteristics: arrogant dogmatism, violence of language, irritable vanity, a constant tendency to self-glorification, which we expect to find only in the charlatan and the impostor, are in him combined with extensive real knowledge, with acute reasoning, with an observation of facts and details almost unparalleled. He displays everywhere what Naudé calls "an intellect teeming with heroic thought." But he is only the naturalist of his own time.

His *Exercitationes* upon the *De Subtilitate* of Cardan (1557) is the book by which Scaliger is best known as a philosopher. Its numerous editions bear witness to its popularity, and until the final fall of Aristotle's physics it continued a popular text-book. He died at Agen, October 21, 1558.

2. Joseph Justus Scaliger, the greatest scholar of modern times, was the tenth child and third son of Julius Cæsar Scaliger and Andiette de la Roque Lobejac (see above). Born at Agen in 1540, he was sent when twelve years of age, with two younger brothers, to the college of Guienne at Bordeaux, then under the direction of Jean Gelida.

In 1558, on the death of his father, he proceeded to Paris, and spent four years at the university there. In 1570 he accepted the invitation of Cujas, and proceeded to Valence to study jurisprudence under the greatest living jurist. Here he remained three years, profiting not only by the lectures but even more by the library of Cujas, which filled no less than seven or eight rooms, and included 500 manuscripts.

The massacre of St. Bartholomew—occurring as he was about to accompany the bishop of Valence on an embassy to Poland—induced him with other Huguenots to retire to Geneva, where he was received with open arms, and was appointed a professor in the academy. He lectured on the *Organon* of Aristotle and the *De Finibus* of Cicero with much satisfaction to the students but with little to himself. He hated lecturing, and was bored to death with the importunities of the fanatical preachers. His editions of the *Catalecta* (1574), of Festus (1576), of Catullus, Tibullus, and Propertius (1577), are the work of a man who writes not only books of instruction for learners, but who is determined himself to discover and communicate to others the real meaning and force of his author. It was reserved for his edition of Manilius (1579), and his *De Emendatione Temporum* (1583), to revolutionize all the received ideas of the chronology of ancient history. His commentary on Manilius is really a treatise on the astronomy of the ancients, and it forms an introduction to the *De Emendatione Temporum*, in which he examines by the light of modern and Copernican science the ancient system as applied to epochs, calendars, and computations of time, showing upon what principles they were based.

In the remaining twenty-four years of his life he at once corrected and enlarged the basis which he had laid in the *De Emendatione.* With incredible patience, sometimes with a happy audacity of conjecture which itself is almost genius, he succeeded in reconstructing the lost *Chronicle* of Eusebius—one of the most precious remains of antiquity, and of the highest value for ancient chronology. This he printed in 1606 in his *Thesaurus Temporum*, in which he collected, restored, and arranged every chronological relic extant in Greek or Latin. In 1590 Lepsius retired from Leyden, where for twelve years he had been professor of Roman history and antiquities. The university and its protectors, the states-general of Holland and the prince of Orange, resolved to obtain Scaliger as his successor. He declined their offer. The invitation was renewed in the most gratifying and flattering manner a year later. This offer Scaliger provisionally accepted. About the middle of 1593 he started for Holland, where he passed the remaining thirteen years of his life, never returning to France.

For the first seven years of his residence at Leyden his reputation was at its highest point. In 1594, in an evil hour for his happiness and his reputation, he published his *Epistola de Vetustate et Splendore Gentis Scaligeræ et J. C. Scaligeri Vita.* In 1607 Gaspar Scioppius, then in the service of the Jesuits, whom he afterward so bitterly libeled, published his *Scaliger Hypobolimæus* ("The Supposititious Scaliger"), a quarto volume of more than four hundred pages, written with consummate ability, in an admirable and incisive style, with the entire disregard for truth which Scioppius always displayed, and with all the power of that sarcasm in which he was an accomplished master. Every piece of gossip or scandal which could be raked together respecting Scaliger or his family is to be found there. The author professes to point out five hundred lies in the *Epistola de Vetustate* of Scaliger; but the main argument of the book is to show the falsity of his pretensions to be of the family of La Scala, and of the narrative of his father's early life, and to hold up both father and son to contempt and ridicule as impudent impostors. To Scaliger the blow was crushing. It certainly embittered the few remaining months of his life, and it is not improbable that the mortification which he suffered may have shortened his days. The *Confutatio* was his last work. Five months after it appeared, "on January 21, 1609, at four in the morning, he fell asleep in Heinsius' arms. The aspiring spirit ascended before the Infinite. The most richly stored intellect which had ever spent itself in acquiring knowledge was in the presence of the Omniscient" (Pattison).

SCAMMONY. Under this name the dried juice of the root of *Convolvulus Scammonia*, L. (σκαμωνία), is used in medicine. The drug is collected principally in Asia Minor, and near Aleppo in Syria, although a little is obtained from the neighborhood of Mount Carmel and the Lake of Tiberias. The principal places of export are Smyrna and Aleppo (Scanderoon), but the drug often bears in commerce the name of the district where it was collected, *e.g.*, Broussa, Angora, etc. Formerly Aleppo scammony was considered the best and commanded the highest price, but at present the purest article comes from Smyrna.

Scammony is used in medicine as a safe but energetic purgative, and is frequently prescribed in combination with calomel and colocynth. Its medicinal activity is due to the resin scammonin, which is also called jalapin from its occurrence in the root of the male jalap (*Ipomœa orizabensis*), and of Tampico jalap (*I. simulans*) (see Jalap).

SCANDERBEG, *i.e.*, Iskander (Alexander) Bey, is the Turkish name and title of George Castriota, the youngest son of John Castriota, lord of an hereditary principality in Albania. He was born about the year 1404. He early distinguished himself as a soldier and received high promotion under Amurath II. In 1443 he was of the expedition against the Magyars, but shortly after taking the field he heard of his father's death, and resolved to strike a blow for freedom. Availing himself of the opportunity afforded by John Hunyady's defeat of the Turks at Nish, he forced from the principal secretary of the sultan a firman making him governor of Croya, his native town, and forthwith left the camp with 300 Albanian horsemen. Once master of the place, he abjured Islam and proclaimed his independence. The Albanians soon recognized him as their head, and flocked to his standard, and pasha after pasha was vainly sent to crush him. Amurath II. in person unsuccessfully besieged him in 1450, and Mohammed II. found it necessary to grant him favorable terms of peace in 1461. He died in January, 1467, at Alessio.

SCANDEROON (Iscanderûn), or Alexandretta, lies girdled by green hills on the picturesque bay of the same name, the ancient *Sinus Issicus*, at the extreme north of the Syrian coast, where it forms an angle with that of Asia Minor. Alexandretta succeeded an older town of Alexandria (Little Alexandria) founded by Alexander the Great, but does not perhaps occupy quite the same site.

SCANDINAVIAN LANGUAGES. By this expression we understand the closely allied languages which are and have been spoken by the Germanic population in Scandinavia, and by the inhabitants of the countries that have been wholly or partially peopled from it. At present the territory of these languages embraces—Sweden, except the most northerly part (Lapland and inland parts of Vesterbotten, where Finnish and Lappish exclusively or chiefly prevail); certain islands and districts on the coast of western and southern Finland, as well as Aland; a small tract on the coast of Esthonia, where Swedish is spoken, as it is also to some extent in the Esthonian islands of Dagö, Nargö, Nukkö, Ormsö, and Ragö, Gammalsvenskby ("Galsvenskbi") in southern Russia (government of Kherson, a village colonized from Dagö); the Livonian island of Runö, where Swedish is spoken, as it formerly was on the island of Ösel; Norway, except certain regions in the northern part of the country, peopled by Finns and Lapps (diocese of Tromsö); Denmark, with the Faroes, Iceland and Greenland, where, however, Danish is only spoken by a very small part of the population; the northernmost part of Schleswig; and, finally, several Scandinavian colonies in the United States. Scandinavian dialects have besides been spoken for varying periods in the following places: Norwegian in certain parts of Ireland (800–1300 A.D.) and in northern Scotland, in the Isle of Man, the Hebrides (800–1400 or longer), the Shetland Islands (800–1800), and the Orkneys (800–1800); Danish in the whole of Schleswig, in the northeastern part of England (the "Danelag"), and in Normandy (900–1000, or a little longer); Swedish in Russia (from the end of the ninth to the beginning of the eleventh century). At what epoch the Germanic population settled in Scandinavia we cannot as yet approximately decide. It is quite certain, however, that it already existed there before the Christian era—nay, most probably as early as the beginning of the so-called Stone Age (three thousand years before Christ). If this view be correct, the Scandinavian languages have had an existence of more than 4,000 years. But we do not know anything about them during the period before the birth of Christ. It is only from that epoch we can get any information concerning the language of the old Scandinavians, which seems by that time not only to have spread over Denmark and great parts of southern and middle Sweden and of (southern) Norway, but also to have reached Finland (at least Nyland) and Esthonia. In spite of its extension over this considerable geographical area, the language appears to have been fairly homogeneous throughout the whole territory. Consequently, it may be regarded as a uniform language, the mother of the younger Scandinavian tongues, and accordingly has been named the primitive Scandinavian (*urnordisk*) language. The oldest sources of our knowledge of this tongue are the words which were borrowed during the first centuries of the Christian era (some of them perhaps even earlier) by the Lapps from the inhabitants of central Sweden and Norway, and by the Finns from their neighbors in Finland and Esthonia, and which have been preserved in Finnish and Lappish down to our own days. These borrowed words, denoting chiefly utensils belonging to a fairly advanced stage of culture, amount to several hundreds, with a phonetic form of a very primitive stamp; as Finn. *terva* (O. Sw. *tiæra*, Germ. *theer*), tar; *airo* (O. Sw. *ar*), oar; *kansa* (O. H. G. *hansa*), people; *napakaira* (O. H. G. *nabagêr*, O. Sw. *navar*), auger; *nekla* (Got. *nêpla*, O. Sw. *nal*), needle; *ansas* (Got .*ans*, O. Sw. *as*), beam; Lapp *sajet* (Got. *saian*, O. Sw. *sa*), sow; *garves* (O. H. G. *garawêr*, O. Sw. *gör*), finished; *divres* (O. Sax. *diuri*, O. Sw. *dyr*), dear; *saipo* (O. H. G. *seifa*, Sw. *sapa*), soap. These words, with those mentioned by contemporary Roman and Greek authors, are the oldest existing traces of any Germanic language. Wrested from their context, however, they throw but little light on the nature of the original northern tongue. But a series of linguistic monuments have come down to us dating from the end of the so-called early Iron Age (about 450 A.D.)—the knowledge and the use of the old runic alphabet (with twenty-four characters) having at that period been propagated among the Scandinavians by the southern Germanic tribes. In fact we still possess, preserved down to our own times, primitive northern runic inscriptions, the oldest upon the utensils found at *Thorsbjerg*, dating back to about 300 A.D., which, together with the MS. fragments of Ulfila's Gothic translation of the Bible, about two hundred years later in date, constitute the oldest veritable monuments of any Germanic tongue. These runic inscriptions are for the most part found on stone monuments (sometimes on rocks) and bracteates (gold coins stamped on one side and used for ornaments), as well as on metallic and wooden utensils, weapons, and ornaments. Up to this time there have been discovered more than one hundred, but of these only about one-half give us any information concerning the language, and most of them are only too short The longest one, the stone monument of *Tune*, in southeastern Norway, contains only sixteen words. Their language is somewhat later in character than that of the oldest words borrowed by the Lapps and Finns: accented *é*, for example, is already changed into *ą* (*cf.* *mari*R=Goth. *mêrs*, renowned; but the Finn. borrowed word *nêkla*=Goth *nepla*, needle), and the voiced *s* into a kind of *r* (*cf.* *daga*R=Goth. *dags*, day; but Finn. *armas* = Goth. *arms*, poor). On the other hand, in all essential matters it is much earlier in character than the language of contemporary Gothic manuscripts, and no doubt approaches more nearly than any Germanic idiom the primitive form of the Germanic tongue. For the sake of comparison, we give a Gothic translation of one of the oldest of the primitive Scandinavian inscriptions, that on the golden horn of *Gallehus*, found on the Danish-German frontier, and dating from about 400 A D.:—

Scand.: EK HLEWAGASTIR. HOLTINGAR. HORNA. TAWIDO;

Goth.: *ik hliugasts. hultiggs. haurn. tawida;*

Engl.: I, HlewagastiR, son of Holta, made the horn;

as well as the inscription on the stone-monument of *Järsbärg* in western Sweden, which is at least a hundred years later:—

Scand.: UBAR HITE. HARABANAR WIT IAH EK ERILAR RUNOR WARITU;

Goth.: *ufar hita, hrabns wit jah ik airils rûnôs writu;*

Engl.: In memory of HitaR. We both, HarabanaR and I ErilaR, wrote the runes.

Although very brief, and not yet thoroughly interpreted, these primitive Scandinavian inscriptions are nevertheless sufficient to enable us to determine with some certainty the relation which the language in which they are written bears to other languages. Thus it is proved that it belongs to the Germanic family of the Indo-European stock of languages, of which it constitutes an independent and individual branch. Its nearest relation being the Gothic, these two branches are sometimes taken together under the general denomination *Eastern Germanic*, as opposed to the other Germanic idioms (German, English, Dutch, etc.), which are then called *Western Germanic.* The most essential point of correspondence between the Gothic and Scandinavian branches is the insertion in certain cases of *gg* before *w* and *j* (*ggj* in Gothic was changed into *ddj*), as in gen. plur. O. H. G. *zweiio*, O. Engl. *twega* (two), compared with O. Icel., O. Norw. *tveggja*, O. Sw., O. Dan. *tviggjæ*, Goth. *twaddjê;* and, still, in Germ. *treu*, Engl. *true*, compared with Sw., Norw., Dan. *trygg*, Icel. *tryggr*, Goth. *triggws.* However, even in the primitive Scandinavian age the difference between Gothic and Scandinavian is more clearly marked than the resemblance; thus, for example—just to hint only at some of the oldest and most essential differences—Goth. nom. sing. ending in -s corresponds to primitive Scandinavian -*a*R, -*i*R (as Goth. *dags*, day, *gasts*, guest =Scand. *daga*R, *gasti*R); Goth. gen. sing. in -*is* to Scand. -*as* (as Goth. *dagis*, day's = Scand. *da gas*); Goth. dat. sing. in -*a* to Scand. -*e* (as Goth. *kaurna*, corn = Scand. *kurne*); Goth. 1st pers. sing. pret. in -*da* to Scand. -*do* (as Goth. *tawida*, did=Scand. *tawido*).

As early as the beginning of the so-called later Iron Age (about 700 A.D.) the primitive Scandinavian language had undergone a considerable transformation, as is proved for example by the remarkable runic stone at *Istaby* in the south of Sweden, with the inscription—

AFATR HARIWULAFA HAþUWULAFR HAERUWULAFIR WARAIT RUNAR ÞAIAR;

Engl.: In memory of HariwulfR, HaÞuwulfR, son of HeruwulfR, wrote these runes.

Here, *e.g.*, we find nom. sing. in -*a*R changed into -*r* (*cf.* *hapuwulaf*R with *holtinga*R on the golden horn), and the plural ending -*o*R into -*a*R (*cf.* *runa*R with *runo*R on the Järsbärg-stone). At the beginning of the so-called Viking Period (ahout 800 A.D.) the Scandinavian language seems to have undergone an extraordinarily rapid development, which in a comparatively short time almost completely transformed its character. This change is especially noticeable in the dropping of unaccented vowels, and in the introduction of a certain vowel harmony of different kinds ("Umlaut," vowel changes, caused by a following *i* (*j*) or *u* (*w*), as *kvæδi* for *kwáδi*, poem, and "Brechung," as *healpa* instead of *helpa*, to help), different assimilations of consonants (as *ll*, *nn* for *lp*, *np; ll*, *nn*, *rr*, and *ss* for *l*R *n*R *r*R, and *s*R), dropping of *w* before *o* and *u* (as *orδ*, *ulfr* for *worδ*, word, *wulf*R, wolf), simplified inflection of the verbs, a new passive formed by means of affixing the reflexive pronoun *sik* to the active form (as *kalla-sk*, to call one's self, to be called), etc.

At this epoch, therefore, the primitive Scandinavian language must be considered as no longer existing. The next two centuries form a period of transition as regards the language as well as the alphabet which it employed. We possess some inscriptions belonging to this period, in which the old runic alphabet of twenty-four characters is still used, and the language of which closely resembles that of the primitive Scandinavian monuments, as, for example, those on the stones of *Stentoften* and *Björketorp*, both from southern Sweden, probably dating from the tenth century, and being the longest inscriptions yet found with the old runic alphabet. On the other hand, inscriptions have come down to us dating from about the middle of the ninth century, in which the later and exclusively Scandinavian alphabet of sixteen characters has almost completely superseded the earlier alphabet, from which it was developed, while the language not only differs widely from the original Scandinavian, but also exhibits dialectical peculiarities suggesting the existence of a Danish-Swedish language as opposed to Norwegian, as the form *ruulf* on the stone at *Flemlöse* in Denmark, which, in a Norwegian inscription, would have been written *hruulf*, corresponding to *Hrolf* in Old Norwegian literature. These differences, however, are unimportant, and the Scandinavians still considered their language as one and the same throughout Scandinavia, and named it *Donsk tunga*, Danish tongue. But when Iceland was colonized at the end of the ninth and the beginning of the tenth century, chiefly from western Norway, a separate (western) Norwegian dialect gradually sprang up, at first of course only differing slightly from the mother-tongue. It was not until the introduction of Christianity (about 1000 A.D.) that the language was so far differentiated as to enable us to distinguish, in runic inscriptions and in the literature which was then arising, four different dialects, which have ever since existed as the four literary languages—Icelandic, Norwegian, Swedish, and Danish. Of these the latter two, often comprehended within the name of *Eastern Scandinavian*, as well as the former two, *Western Scandinavian*, or, to use the Old Scandinavians' own name, *Norr'œnt mál*, Northern tongue, are very nearly related to each other.

SCARBOROUGH, a parliamentary borough of England, frequently called "the Queen of Watering Places," situated on the east coast of Yorkshire, in the North Riding, forty miles from York.

The town is a royal borough, its charter of incorporation dating from 1161. It returned two members to parliament from 1283 to 1885, when one of the seats was taken away. The limits of the municipal and parliamentary boroughs coincide—the area being 2,348 acres, the population 24,259 in 1871 and 30,504 in 1881.

Ship-building, salt manufacture and knife-making were formerly common, but the only craft now remaining is jet-manufacture. The fishing trade is, however, very considerable.

SCARLATTI, ALESSANDRO, composer of sacred and dramatic music, was born at Trapani in Sicily in 1659, and became in early youth a pupil of Carissimi. In 1680 Queen Christina of Sweden appointed him her maestro di cappella, and commissioned him to write his first opera, *L'Onestà nell' Amore*, for performance at her palace in Rome. In 1693 he produced his first oratorio, *I Dolori di Maria sempre Vergine*. In the following year he was appointed maestro di cappella to the viceroy of Naples, and from that time forward his works multiplied with astonishing rapidity, his time being spent partly in Naples and partly in Rome, where he entered the service of Cardinal Ottoboni, as private maestro di cappella. In 1707 Scarlatti was appointed principal maestro di cappella at Santa Maria Maggiore, and soon afterward he was invested by the pope with the order of the Golden Spur, with which Gluck and Mozart were afterward honored. He resigned his appointment after two years' service, and died at Naples, October 24, 1725.

SCARLATTI, DOMENICO, son of the preceding, was born at Naples in 1683, and studied music first under his father and then under Gasparini. He began his career by composing a few operas, among them *Amleto*, produced at Rome in 1715, and remarkable as the earliest known attempt to pose Shakespeare's hero as the *primo uomo* of a *dramma per la musica*. But his real strength lay in the excellence of his performances on the harpsichord and organ.

On the death of Bai in 1715 D Scarlatti was appointed maestro di capella of St. Peter's in Rome. He then returned to Naples; but in 1729 he was invited to Madrid, with the appointment of teacher to the princess of Asturias, and remained there twenty-five years, returning in 1754 to Naples, where he died in 1757

SCARLET FEVER and SCARLATINA are names applied indifferently to an acute infectious disease, characterized by high fever, accompanied with sore throat and a diffuse red rash upon the skin. This fever appears to have been first accurately described by Sydenham in 1676, before which period it had evidently been confounded with small-pox and measles.

The period of incubation in scarlet fever (that is, the time elapsing between the reception of the poison and the development of symptoms) appears to vary. Sometimes it would seem to be as short as one or two days, but in most instances it is probably about a week. The invasion of this fever is generally sudden and sharp, consisting in rigors, vomiting, and sore throat, together with a rapid rise of temperature and increase in the pulse. Occasionally, especially in young children, the attack is ushered in by convulsions. These premonitory symptoms usually continue for about twenty-four hours, when the characteristic eruption makes its appearance. It is first seen on the neck, chest, arms, and hands, but quickly spreads all over the body, although it is not distinctly marked on the face. This rash consists of minute thickly-set red spots, which coalesce to form a general diffuse redness, in appearance not unlike that produced by the application of mustard to the skin. In some instances the redness is accompanied with small vesicles containing fluid In ordinary cases the rash comes out completely in about two days, when it begins to fade, and by the end of a week from its first appearance it is usually gone. The severity of a case is in some degree measured by the copiousness and brilliancy of the rash, except in the malignant varieties, where there may be little or no eruption. The tongue, which at first was furred, becomes about the fourth or fifth day denuded of its epithelium and acquires the peculiar "strawberry" appearance characteristic of this fever. The interior of the throat is red and somewhat swollen, especially the uvula, soft palate, and tonsils, and a considerable amount of secretion exudes from the inflamed surface. There is also tenderness and slight swelling of the glands under the jaw. In favorable cases the fever departs with the disappearance of the eruption, and convalescence sets in with the commencement of the process of "desquamation" or peeling of the cuticle, which first shows itself about the neck, and proceeds slowly over the whole surface of the body. Where the skin is thin the desquamation is in the form of fine branny scales; but where it is thicker, as about the hands and feet, it comes off in large pieces, which sometimes assume the form of casts of the fingers or toes. The duration of this process is variable, but it is rarely complete before the end of six or eight weeks, and not infrequently goes on for several weeks beyond that period. It is during this stage that complications are apt to appear, particularly those due to cold, such as inflammation of the kidneys; and all throughout its continuance there is the further danger of the disease being communicated to others by the cast-off epidermic scales.

The complications and effects of scarlet fever are among the most important features in the disease, and, although their occurrence is exceptional, they appear with sufficient frequency, and are of such a nature, as ought to make the medical attendant carefully watch every case for any of their early indications. The most common and serious of these is inflammation of the kidneys, which may arise during any period in the course of the fever. In favorable cases this symptom may soon disappear, but may on the other hand prove extremely serious—the risks being the suppression of urine, leading to uræmic poisoning and causing convulsions which may terminate fatally, or, further, the rapid development of general dropsy, and death from this cause. Although thus a very formidable complication, it is yet one which is amenable to treatment, and by the prompt and judicious application of remedies lives may often be saved, even in desperate circumstances. Occasionally this condition does not wholly pass off, and consequently lays the foundation for BRIGHT'S DISEASE, (*q.v.*) Another of the more common complications or results of scarlet fever is suppuration of the ear, due to the extension of the inflammatory process from the throat along the Eustachian tube into the middle ear. This not infrequently leads to permanent ear-discharge, with deafness from the disease affecting the inner ear and temporal bone, a condition implying a degree of risk from its proximity to the brain. Other maladies affecting the heart, lungs, pleura, etc., occasionally arise in connection with scarlet fever, but they are of less common occurrence than those previously mentioned. Apart, however, from such definite forms of disease, there may remain as the result of scarlet fever simply a general weakening of health, which may render the patient delicate and vulnerable for a long time.

In the treatment of scarlet fever, one of the first requirements is the isolation of the case, with the view of preventing the spread of the disease. In large houses this may be possible, but in most instances it can only be satisfactorily accomplished by sending away those other members of the family who have not suffered from the fever. The establishment in many large towns of hospitals for infectious diseases, which provide accommodation for patients of all classes, affords the best of all opportunities for thorough isolation. In large families, where few or none of the members have had the disease, the prompt removal of a case to such a hospital will in many instances prevent the spread of the fever through the household, as well as beyond it, and at the same time obviate many difficulties connected with the cleansing and purification of the house, which, however carefully done, may still leave remaining some risk in the case of a fever the contagious power of which is so intense.

When, however, the patient is treated at home, the sick room should contain only such furniture as may be required, and the attendants should come as little as possible in contact with other members of the household. Should other children be in the house, they should be kept away from school during all the time that the risk of infection continues. The possibility of the fever being communicated by letters sent from the sick room should not be forgotten by those in attendance. Disinfectants, such as carbolic acid, Condy's fluid, etc., may be used freely in the room and passages, and all body or bed clothes when removed should be placed at once in boiling water, or in some disinfecting fluid. In convalescence, with the view of preventing the transmission of the desquamated cuticle, the inunction of the body with carbolized oil (1 in 40) and the frequent use of a bath containing soda are to be recommended.

All books, toys, etc., used by the patient during the illness should be carefully destroyed or given to fever hospitals, as their preservation has frequently been known to cause an outbreak of the disease at a subsequent time. With respect to the duration of the infective period, it may be stated generally that it is seldom that a patient who has suffered from scarlet fever can safely go about before the expiry of eight weeks, while on the other hand the period may be considerably prolonged beyond this, the measure of the time being the completion of the process of desquamation in every portion of the surface of the body. As to general management during the progress of the fever, in favorable cases little is required beyond careful nursing and feeding. The diet all through the fever and convalescence should be of light character, consisting mainly of milk food. Soups may be taken, but solid animal food should as far as possible be avoided. During the febrile stage a useful drink may be made by a weak solution of chlorate of potash in water (one drachm to the pint), and of this the patient may partake freely. In the more severe forms of the disease, where the throat is much affected, the application with a brush of a strong solution of Condy's fluid or other disinfectant, such as boroglyceride, glycerine of carbolic acid, quinine, etc., may be required, or gargling with these substances when this can be done. In the malignant variety, where the eruption is not appearing, or is but ill developed, stimulants internally, and the hot bath or pack, may sometimes afford a chance, or the hypodermic use of pilocarpin—although it must be confessed that in such cases little can be expected from any remedies. The treatment of the kidney complication and its accompanying dropsy is similar to that for acute Bright's disease. Depletion by leeching or cupping the loins, and the promotion of cutaneous action by a hot air bath or a hot wet pack, or by pilocarpin, are the most useful measures, and will often succeed in saving life. The abscesses of the neck which occasionally occur as complications should be opened antiseptically, while the ear disorders, which are apt to continue long after the termination of convalescence, will demand the special attention of the aurist.

SCARRON, PAUL, poet, dramatist, novelist, and husband of Madame de Maintenon, was born, or at least baptized, on July 4, 1610. He died in 1660.

SCAUP, the *Anas marila* of Linnæus and *Fuligula marila* of modern systematic writers, a very abundant bird around the coasts of most parts of the northern hemisphere, repairing inland in spring for the purpose of reproduction, though so far as is positively known only in northern districts, as Iceland, Lapland, Siberia, and the fur-countries of America. It was many years ago believed to have been found breeding in Scotland, but assertions to that effect have not been wholly substantiated, though apparently corroborated by some later evidence. The Scaup duck has considerable likeness to the POCHARD, in both habits and appearance; but it much more generally affects salt-water, and the head of the male is black, glossed with green, and hence the name "Blackhead," by which it is commonly known in North America, where, however, a second species or race, smaller than the ordinary one, is also found, the *Fuligula affinis*. The female Scaup duck can be readily distinguished from the Dunbird or female Pochard by her broad, white face.

SCEPTER. Though the scepter is now used principally as one of the insignia of royalty, the word originally had a more extended meaning. Among the early Greeks the *σκηπτρον* was simply a long staff used by aged men (*Il.* xviii. 416; Herod., i. 196), and thus came to be used as a sign of authority by officials of many kinds—judges, military leaders, priests, heralds, and others. It is frequently represented on Greek painted vases as a long staff, tipped with metal in some ornamental fashion, and is borne by some of the gods. Among the Etruscans scepters of great magnificence were used by the kings and also by the upper orders in the priesthood. Many representations occur on the walls of the painted tombs of Etruria. Some specimens which still exist are among the finest examples known of ancient jewelry.

The scepter of the Romans, like most of their insignia of rank, is said to have been derived from the Etruscans. An old and more Latinized form of the word is *scipio*. Under the republic an ivory scepter (*sceptrum eburneum*) was one of the marks of consular rank. It was also used by victorious generals who received the title of *imperator*, and this use still survives in the modern marshal's baton. In Roman paintings the long staff-like scepter is frequently represented in the hands of Jupiter and Juno, as chief of the gods.

Under the empire the *sceptrum Augusti* was specially used by the emperors. It was often of ivory, tipped with a gold eagle. After the introduction of Christianity as the state religion, the imperial scepter was frequently tipped with a cross instead of the eagle, though both were used. All through the Middle Ages both these forms survived, and scepters of gold studded with jewels were used by most sovereigns of Europe. The gold scepter of Charlemagne, a magnificent specimen of early jeweler's work, still exists among the regalia at Vienna. Some mediæval scepters were of crystal or ivory mounted in gold. Several fine ancient examples existed among the regalia of England till after the death of Charles I., when the whole set was broken up and melted by order of the Parliament.

At the Restoration, four new scepters were made for the coronation of Charles II., and these still exist among the regalia in the Tower of London. In addition to these four, there is a gold-mounted ivory scepter, which was made for the queen of James II.; it is tipped with a gold dove and is studded with jewels. A sixth gold scepter is that which was made for the queen at the coronation of William and Mary.

Among the Scottish regalia at Edinburgh a fine fifteenth-century gold scepter still exists; and others of the same or earlier date are preserved among the royal insignia of several European countries.

SCHADOW, a distinguished name in the annals of German art.

I. JOHANN GOTTFRIED SCHADOW, an eminent sculptor, was born in 1764 in Berlin, where his father was a poor tailor. Over half a century, crowded with commissions, he persistently produced upward of 200 works, varied in style as in subjects. Of church monuments and memorial works thirty are enumerated; yet Schadow hardly ranks among Christian sculptors. Schadow, as director of the Berlin Academy, gave proof of intellectual powers which made him a leader and secured many and devoted followers. Personal influence he extended and fortified by his books. He wrote on the proportions of the human figure, on national physiognomy, etc.; and many volumes by himself and others describe and illustrate his method and his work. He died, full of honors, at Berlin in 1850.

II. RUDOLPH SCHADOW, sculptor, son of the preceding, was born in Rome in 1786. Rudolph in 1810 obtained the pension for Rome, and received kindly help from Canova and Thorwaldsen. His last composition, commissioned by the king of Prussia, was a colossal group, *Achilles with the Body of Penthesilea;* the model, universally admired for its antique character and the largeness of its style, had not been carried out in marble when, in 1822, the artist died in Rome.

III. FRIEDRICH WILHELM SCHADOW, painter, born in 1789 in Berlin, was the second son of Johann Gottfried Schadow, the sculptor, from whom he received his earliest instruction. Schadow was in 1819 appointed professor in the Berlin Academy, and his ability and thorough training gained devoted disciples. To this period belong pictures for churches. In 1826 the professor was made director of the Düsseldorf Academy, and so highly were his character and teachings esteemed that some of the best scholars accompanied their master. The high and sacred art matured in Rome, Schadow transplanted to Düsseldorf; he reorganized the Academy, which in a few years grew famous as a center of Christian art, to which pupils flocked from all sides. Schadow died at Düsseldorf in 1862, and a monument in the platz which bears his name was raised at the jubilee held to commemorate his directorate.

SCHAFARIK (in Bohemian SAFARIK), PAUL JOSEPH, was by origin a Slovak, and was born in 1795 at Kobeljarova, a village of northern Hungary, where his father was a Protestant clergyman. It was not till his sixteenth year that any enthusiasm was aroused in him for the language and literature of his race. At this time an essay of Jungmann's fell into his hands, and at once gave a direction to his studies. His first production was a volume of poems in Bohemian entitled *The Muse of Tatra with a Slavonic Lyre*, published at Levocza in 1814. In 1826 his *Geschichte der Slawischen Sprache und Literatur nach allen Mundarten* appeared at Pesth. In 1833 appeared his *Serbische Lesekörner odor historisch-kritische Beleuchtung der Serbischen Mundart*, and in 1837 his great work *Slovanské Straozitnosti* ("Slavonic Antiquities"), by which he is at the present time best known. In 1840 he published in conjunction with Palacky *Die ältesten Denkmäler der Böhmischen Sprache.* In 1842 he published his valuable work *Slovansky Národopis*, which gives a complete account of Slavonic ethnology. In 1848 he was made professor of Slavonic philology in the university of Prague, but resigned it in the following year. He was then made keeper of the university library, in which office he continued till his death in 1861.

SCHAFFHAUSEN, in area (117 square miles) and actual population (38,348) the nineteenth and in relative density of population the seventh of the cantons of Switzerland, forms the most northern angle of the Swiss territory, and lies on the right or German side of the Rhine, which separates it from the cantons of Thurgau and Zurich. It is divided into three distinct portions by spurs of the grand-duchy of Baden, which also possesses the small enclave of Büsingen on the Rhine. The population, which increased from 35,300 in 1850 to 38,348 in 1880, is almost exclusively of German speech (230 individuals only using other languages). Protestants are to Roman Catholics as 8 to 1 (33,897 and 4,154); the latter are attached to the bishopric of Basel. Schaffhausen has been a member of the Swiss confederation since 1501.

SCHAFFHAUSEN, the capital of the above canton, is situated on the bank of the Rhine, thirty and a half miles by rail west of Constance and sixty east of Basel, and communicates by a bridge with the village of Feuerthalen (1,000 inhabitants) in Zurich. Among the industrial establishments of the city and vicinity are ironworks, wagon and carriage factories, woolen and cotton factories, breweries, distilleries, and champagne factories. The population of the commune was 10,303 in 1870 and 11,795 in 1880.

SCHALCKEN, Godfried, genre and portrait painter, was born at Dort in 1643. He executed several Scriptural subjects—such as that of the *Wise and Foolish Virgins*, at Munich—of very indifferent merit. He died at the Hague in 1706.

SCHAMYL (*i.e.*, Samuel), prophet and hero of the Caucasian mountaineers, was born in 1797. After his defeat and capture he passed ten years in Russia, where he was well treated. In 1870 he went on a pilgrimage to Mecca, and died at Medina in March of the following year.

SCHANDAU, a small town of Saxony, is situated on the right bank of the Elbe, at the mouth of the little valley of the Kirnitzsch, twenty-one miles to the southeast of Dresden, and four miles from the Bohemian frontier. Its position in the heart of the romantic "Saxon Switzerland" gives it an importance to which on other grounds it is not entitled, and thousands of tourists make it their headquarters in summer. The stationary population in 1880 was 3,301.

SCHARNHORST, Gerhard Johann David von, Prussian general, celebrated as the author of the so-called "Krümpersystem," or short-service system, by which the Prussian nation was prepared for the war of liberation, was a Hanoverian by birth, and served in the Hanoverian army from 1778 to 1801, when he passed into Prussian service, and soon became the leader in the reconstruction of its forces. He died in 1813.

SCHÄSSBURG (Hung. *Segesvár*), chief town of the Transylvanian county of Nagy-Küküllö, Hungary, stands on the river Nagy-Küküllö, twenty-four miles east-southeast of Maros-Vásárhely. The population in 1884 amounted to 8,810, the majority being Germans (Saxons), and the remainder Roumanians and Hungarians.

SCHAUMBURG-LIPPE. See Lippe.

SCHEELE, Karl Wilhelm, an eminent chemist, was born at Stralsund, the capital of Pomerania, which then belonged to Sweden, on December 19, 1742. In 1765 he removed to Malmö, and resided for five years with Kalström, an apothecary, whence he removed to Stockholm, to Scharenberg, also an apothecary. While here he wrote out an account of his experiments with cream of tartar, from which he had isolated tartaric acid. In 1771 Scheele finished an elaborate inquiry into the composition of the beautiful mineral fluor-spar, and showed that it consisted of lime and a peculiar acid which he called fluor acid. He misunderstood, however, the true character of the decomposition he had effected, and gave an erroneous explanation of it. His experiments had been conducted in glass vessels, and he was not aware that what he actually got was the fluo-silicic acid. This mistake was subsequently pointed out and corrected by some other chemists.

The discoveries with which Scheele enriched chemistry are numerous and important. Reference has been already made to the discovery of tartaric acid and of the composition of fluor-spar. The analysis of manganese oxide in 1774 led him to the discovery of chlorine and of baryta (*terra ponderosa*, as it was called), to individualizing the salts of manganese itself, including the green and purple compounds with potash, and to the explanation of how manganese colors and decolorizes glass. In 1775 he showed how to prepare benzoic acid by precipitating it from a solution in lime, and he investigated arsenic acid and its reactions with different substances, discovering arseniuretted hydrogen and the green color "Scheele's green"—a process for preparing which on a large scale he published in 1778. Other researches of this period were concerned with the nature of quartz, clay, and alum, and with an animal concretion or calculus from which he got for the first time uric acid. The treatise on *Air and Fire* appeared in 1777.

In 1778 he proposed a new method of making calomel and powder of algaroth. He also examined a mineral, *molybdæna nitens*, which had been supposed to contain lead, but which he showed was quite distinct, and he got from it molybdic acid. He demonstrated in 1779 that plumbago consists almost solely of carbon, and he published a record of estimation of the amount of pure air, *i.e.*, of oxygen, contained in the atmosphere, which he had carried on daily during the entire year of 1778. In 1780 he showed that the acidity of sour milk was due to a peculiar acid, now called lactic acid; and from milk sugar, by boiling it with nitric acid, he obtained mucic acid. His next discovery, in 1781, was the composition of tungsten, since called scheelite, which he found consisted of lime combined with a peculiar acid—tungstic acid. The following year he examined the mode of producing ether, and in 1783 discovered glycerin, the sweet principal of fats and oils. In 1782–83 appeared a research which—of all those Scheele conducted—exhibits his experimental genius at its very best. By a wonderful succession of experiments he showed that the coloring matter of Prussian blue could not be produced without the presence of a substance of the nature of an acid, to which was ultimately given the name of prussic acid. He showed how this body was composed, described its properties and compounds, and mentioned its smell and taste, utterly unaware of its deadly character. Nothing but a study of Scheele's own memoir can give an adequate notion of the manner in which he attacked and solved a problem so difficult and complicated as this was at the period in the history of chemistry when Scheele lived. In 1784–85–86 he returned to the subject with which he had begun his career, that of the vegetable acids, and described four new ones—citric, malic, oxalic, and gallic acids. He died in 1786.

SCHEFFER, Ary, Dutch painter, who was born at Dort on February 10, 1795, represents the sentimental phase of the Romantic movement in France. He had little sympathy with the directions given to it by either of its most conspicuous representatives, Sigalon, Delacroix, or Gericault, and made various tentative efforts—before he found his own path. Immediately after the exhibition of the last-named work he turned to Byron and Goethe, selecting from *Faust* a long series of subjects which had an extraordinary vogue. He died in 1858, and the posthumous exhibition of his works did much to damage his fame.

SCHELDT, or Schelde (Fr. *Escaut*, Lat. *Scaldis*,

O. Dutch *Schoude* or *Schouwe*), a river of northwest Europe, belonging for 75 miles of its course to France, 137 to Belgium, and 37 to the Netherlands. The Hont or Western Scheldt, the principal estuary by which nearly all Belgian commerce is conveyed, was probably opened up by a storm in 1173, and in about 1058 must have been a mere narrow creek. The Eastern Scheldt, which then received most of the river, has gradually diminished in importance, and since the construction of the railway bridge across it between the mainland and South Beveland, in 1867, has become completely obstructed with sands. At Antwerp the depth at high water is forty-nine feet.

SCHELLING, FRIEDRICH WILHELM JOSEPH VON, a distinguished German philosopher, was born on January 27, 1775, at Leonberg, a small town of Würtemberg. In 1790, with special permission, for he was yet three years under the prescribed age, Schelling entered the theological seminary at Tübingen, where he had as fellow students, contemporary as scholars though elder in years, Hegel and Hölderlin. In 1792 he graduated in the philosophical faculty with a thesis *Antiquissimi de prima malorum humanorum origine philosophematis explicandi tentamen criticum et philosophicum;* in 1793 he contributed to Paulus' *Memorabilien* a paper *Ueber Mythus, historische Sagen, und Philosopheme der ältesten Welt;* and in 1795 his thesis for his theological degree was *De Maricone Paullinarum epistolarum emendatore.*

In midsummer 1798, Schelling was called as extraordinary professor of philosophy to Jena, and thus stepped into the most active literary and philosophical circle of the time.

Schelling's professoriate in Jena lasted till the early part of 1803. His lectures were extraordinarily attractive; his productive powers were at their best; and the circumstances of his surroundings developed forcibly the good and evil qualities of his character. Of his writings during this period a merely chronological notice will meanwhile suffice. In 1799 appeared the *Erster Entwurf eines Systems der Naturphilosophie*, with an independent and subsequent *Einleitung;* in 1800 the *System des transcendentalen Idealismus*, in form one of the most finished, in substance one of the most satisfactory of his works; in the same year, in the *Zeitschrift für spekulative Physik*, edited by him, *Allgemeine Deduction des dynamischen Processes;* and in 1801 the *Darstellung meines Systems der Philosophie;* in 1802, in the *Neue Zeitschr für spek Physik*, the "Fernere Darstellungen aus dem System der Philosophie;" also in 1802 the dialogue *Bruno* and the excellently written *Vorlesungen über die Methode des akademischen Studiums.* In conjunction with Hegel, who, in 1801, at Schelling's invitation, had come to Jena, he edited the *Kritisches Journal für Philosophie*, the greater part of which was written by Hegel. Regarding the authorship of certain articles in the volume and a half of this *Journal* a discussion of no great significance has arisen, concerning which perhaps the best statement is that by Schelling's son in the preface to vol. v. of the *Sämmtliche Werke*, Abth. i.

The philosophical renown of Jena reached its culminating point during the years of Schelling's residence there, in no small measure through the imposing force of his character and teaching.

A fresh field was found in the newly constituted university of Würtzburg, to which he was called in September, 1803, as professor of "Naturphilosophie," and where he remained till April, 1806, when the Napoleonic conquests compelled a change. The published writings of this period (*Philosophie und Religion*, 1804, and *Ueber das Verhaltniss des Realen und Idealen in der Natur*, 1806), and still more the unpublished draft of his lectures as continued in volumes v. and vi. of the *Sämmtliche Werke*, exhibit an important internal change in his philosophic views.

In Munich, to which he removed in 1806, he found a long and quiet residence. A position as state official, at first as associate of the academy of sciences and secretary of the academy of arts, afterward as secretary of the philosophical section of the academy of sciences, gave him ease and leisure. Without resigning his official position, he lectured for a short time at Stuttgart, and during seven years at Erlangen (1820–27).

During the long stay at Munich (1806–1841) Schelling's literary activity seemed gradually to come to a standstill. The "Aphorisms on Naturphilosophie" contained in the *Jahrbücher der Medicin als Wissenschaft* (1806–8) are for the most part extracts from the Würzburg lectures; and the *Denkmal der Schrift von den göttlichen Dingen des Herrn Jacobi* was drawn forth by the special incident of Jacobi's work. The only writing of significance is the "Philosophische Untersuchungen über das Wesen der menschlichen Freiheit," which appeared in the *Philosophische Schriften*, vol. i. (1809), and which carries out, with increasing tendency to mysticism, the thoughts of the previous work *Philosophie und Religion.* In 1815 appeared the tract *Ueber die Gottheiten zu Samothrake*, ostensibly a portion of the great work, *Die Weltalter*, on which Schelling was understood to be engaged, a work frequently announced as ready for publication, but of which no great part was ever written. Probably it was the overpowering strength and influence of the Hegelian system that constrained Schelling to so long a silence, for it was only in 1834, after the death of Hegel, that, in a preface to a translation by H. Beckers of a work by Cousin, he gave public utterance to the antagonism in which he stood to the Hegelian and to his own earlier conceptions of philosophy. Public attention, which had been from time to time drawn to Schelling's prolonged silence, was powerfully attracted by these vague hints of a new system which promised something more positive, as regards religion in particular, than the apparent results of Hegel's teaching. No authentic information as to the nature of the new positive philosophy was obtained till after his death in 1854, when his sons began the issue of his collected writings with the four volumes of Berlin lectures: vol. i., *Introduction to the Philosophy of Mythology* (1856); ii., *Philosophy of Mythology* (1857); iii. and iv., *Philosophy of Revelation* (1858).

SCHEMNITZ (Hung., *Selmeczbánya*), a mining town in the Cis-Danubian county of Hont, Hungary, lies about sixty-five miles north from Budapest, in 48° 27′ N. latitude, 18° 52′ E. longitude, on an elevated site, 2,300 feet above the level of the sea. The mines are chiefly the property of the state and the corporation; the average yield annually is—gold, 232 pounds; silver, 45,000 pounds; lead, 11,600 hundredweights; copper, 180 hundredweights. Iron, arsenic, etc., are also produced. There are also flourishing potteries where well-known tobacco pipes are manufactured. With Schemnitz is conjoined the town of Bélabánya; their united population in 1884 was 15,265, chiefly Slovaks, of whom nearly 3,000 were engaged in mining.

SCHENECTADY, a city of the United States, county seat of Schenectady county, N. Y., in the valley of the Mohawk river, seventeen miles by rail northwest of Albany, with which it is also connected by the Erie canal. It is best known as the seat of Union college, an institution founded in 1795 by a union of several religious sects, and now possessed of large endowments, extensive buildings, and a valuable library, and along with the Albany medical and law schools, etc., forming the Union university. Besides manufacturing locomotives, iron bridges, and agricultural implements, Schenectady has shawl, hosiery, carriage, and varnish factories. The population was 9,579 in 1860, 11,026 in 1870, 13,655 in 1880, and 19,902 in 1890.

Occupying the site of one of the council grounds of the Mohawks, Schenectady was chosen as a Dutch trading post in 1620, was chartered in 1684, and became a borough in 1765 and a city in 1798. In 1691 it was burned by the French and Indians, and sixty-three of its inhabitants massacred.

SCHETKY, JOHN ALEXANDER, a younger brother of J. C. Schetky (see below), was born in 1785. He studied medicine in Edinburgh university and drawing in the Trustees' academy. As a military surgeon he served with distinction under Lord Beresford in Portugal. He contributed excellent works to the exhibitions of the Royal Academy and of the Water-Color Society, and executed some of the illustrations in Sir W. Scott's *Provincial Antiquities.* He died at Cape Coast Castle, September 5, 1824, when preparing to follow Mungo Park's route of exploration.

SCHETKY, JOHN CHRISTIAN, marine painter, descended from an old Transylvanian family, was born in Edinburgh on August 11, 1778. He studied art under Alexander Nasmyth, and after having traveled on the Continent he settled in Oxford, and taught for six years as a drawing-master. To the Royal Academy exhibitions he contributed at intervals from 1805 to 1872, and he was represented at the Westminster Hall competition of 1847 by a large oil-painting of the battle of La Hogue. He was marine painter to George IV., William IV., and Queen Victoria. He died in London, on January 28, 1874.

SCHEVENINGEN, a fishing village and watering-place in Holland, on the North Sea, about two miles from The Hague, with which it is connected by a shaded avenue with a tramway. Population in 1879, 7,713. Scheveningen has a considerable herring fleet. In a naval engagement off the coast in 1673 De Ruyter defeated the combined forces of the French and English.

SCHIAVONETTI, LUIGI, engraver, was born at Bassano in Venetia, on April 1, 1765. Among his early works are four plates of subjects from the French Revolution, after Benazech. He also produced a *Mater Dolorosa*, after Vandyck, and Michelangelo's cartoon of the *Surprise of the Soldiers on the Banks of the Arno.* From 1805 to 1808 he was engaged in etching Blake's designs to Blair's *Grave.* He died in 1810.

SCHIEDAM, a town of the Netherlands, in the province of South Holland, not far from the confluence of the Schie with the Maas, three miles by rail from Rotterdam. It is best known as the seat of a great gin manufacture, which, carried on in more than 200 distilleries, gives employment besides to malt-factories, cooperages, and cork-cutting establishments, and supplies grain refuse enough to feed about 30,000 pigs. Other industries are shipbuilding, glass-blowing, and candle-molding. The population of the commune increased from 9,157 in 1811 to 12,360 in 1840, 21,103 in 1875, 23,035 in 1880, and 24,321 in 1884; the population of the town was 18,854 in 1870.

SCHIEFNER, FRANZ ANTON, linguist, was born at Revel, in Russia, on July 18, 1817. From 1854 till his death he was an extraordinary member of the Imperial Academy. He died after a fortnight's illness on November 16, 1879.

SCHILLER, JOHANN CHRISTOPH FRIEDRICH, German dramatist and poet, was born at Marbach, in Würtemberg, on the 10th or 11th (probably 10th) November, 1759. At a very early age he gave evidence of a talent for poetry, and it was carefully fostered by his mother, who was herself of a poetic temperament. His parents intended that he should become a clergyman, but this decision was abandoned at the request—practically by the order—of the duke of Würtemberg, who insisted on his being sent to the military academy, an institution which had been established at the Solitude for the training of youths for the military and civil services. Schiller entered this institution early in 1773, when he was between thirteen and fourteen years of age, and he remained in it until he was twenty-one. For some time he devoted himself to the study of jurisprudence, but the subject did not interest him, and in 1775, when a medical faculty was instituted at the academy, he was allowed to begin the study of medicine. In that year the academy was transferred from the Solitude to Stuttgart.

On December 14, 1780, Schiller was informed that he had been appointed medical officer to a grenadier regiment in Stuttgart, and he almost immediately began his new duties. He was not a very expert doctor, and he was too passionately devoted to literature to take much trouble to excel in a profession which he disliked. *Die Räuber* was soon finished, and in July, 1781, it was published at his own expense, some persons of his acquaintance having become security for the necessary amount. This famous play is ill-constructed, and contains much boyish extravagance, but it is also full of energy and revolutionary fervor, and it captivated the imagination of many of Schiller's contemporaries. Early in 1782 it was represented at the Mannheim theater, and it was so warmly applauded that Schiller, who had stolen away from Stuttgart to see his play, began to think it might be possible for him to devote his time wholly to the work of a dramatist. By and by he was persuaded to go again to Mannheim without leave; and for this offense, of which the duke of Würtemberg was informed, he was condemned to two weeks' arrest. Shortly afterward he was peremptorily forbidden to write books, or to hold communication with persons who did not reside in Würtemberg. This tyrannical order filled him with so much indignation that he resolved at all costs to secure freedom, and on September 17, 1782, accompanied by his friend Streicher, a young musician, he fled from Stuttgart.

Schiller had now before him a time of much distress and anxiety. In the course of a few weeks he finished *Fiesco*, a play which he had begun at Stuttgart; but Dalberg, the director of the Mannheim theater, declined to put it on the stage, and the unfortunate poet knew not how he was to obtain the means of living. At the same time it was thought probable that a request for his extradition might be addressed to the elector of the Palatinate. In this perplexity Schiller wrote to Frau von Wolzogen, a friend at Stuttgart, asking to be allowed to take refuge in her house at Bauerbach, a village in the Thuringian Forest, within two hours' walk of Meiningen. This request was granted, and at Bauerbach Schiller remained for nearly seven months, working chiefly at the play which he ultimately called *Cabale und Liebe* and at *Don Carlos*.

In July, 1783, Schiller returned to Mannheim, and this time he obtained from Dalberg a definite appointment as dramatic poet of the Mannheim theater. *Fiesco*, which was soon represented, was received rather coldly, but for this disappointment Schiller was amply compensated by the admiration excited by *Cabale und Liebe.* These two plays express essentially the same mood as that which prevails in *Die Räuber*, but they indicate a striking advance in the mastery of dramatic methods. This is especially true of *Cabale und Liebe*, which still ranks as one of the most effective acting plays in German literature.

In July, 1787, Schiller went to Weimar, where he was cordially welcomed by Herder and Wieland. For several years after this time he devoted himself almost exclusively to the study of history, and in 1788 he published his *Geschichte des Abfalls der vereinigten Niederlande von der Spanischen Regierung*. This was followed by a number of minor historical essays (published in *Thalia*), and by his *Geschichte des dreissigjährigen Krieges*, which appeared in 1792.

On February 22, 1790, Schiller married Charlotte von Lengefeld.

The *Geschichte des dreissigjährigen Krieges* was the last important historical work written by Schiller. He abandoned history in order to study philosophy, which, under the impulse communicated by Kant, was then exciting keen interest among the educated classes of Germany. Schiller's philosophical studies related chiefly to esthetics, on which he wrote a series of essays.

During the years which followed his departure from Mannheim Schiller had written *An die Freude*, *Die Götter Griechenlands*, *Die Künstler*, and other lyrical poems, all of which are of very much higher quality than the poems of his earlier period. But he had been so absorbed by labors of a different kind that he had had little time or inclination for his proper work as a poet. Now, stimulated by intercourse with Goethe, whom he had met in 1788, he began to long once more for the free exercise of his creative faculty; and from 1794 he allowed no year to pass without adding to the list of his lyrical writings. Among the lyrics produced in this, the last and greatest period of his career, the foremost place belongs to the *Lied von der Glocke*, but there is hardly less imaginative power in *Das Ideal und das Leben*, *Die Ideale*, *Der Spaziergang*, *Der Genius*, *Die Erwartung*, *Das Eleusische Fest*, and *Cassandra*. In 1796 Schiller and Goethe together wrote for the *Musenalmanach* (an annual volume of poems, issued for several years by Schiller) a series of epigrams called *Xenien*, each consisting of a distich. Most of them were directed against contemporary writers whom the poets disliked, and much animosity was excited by their sharply satirical tone. A higher interest attaches to *Votivtafeln*, another series of epigrams, written at the same time as the *Xenien*. They are among the most suggestive of Schiller's writings.

Schiller never intended that *Don Carlos* should be his last drama, and from 1791 he worked occasionally at a play dealing with the fate of Wallenstein. He was unable, however, to satisfy himself as to the plan until 1798, when, after consulting with Goethe, he decided to divide it into three parts, *Wallensteins Lager*, *Die Piccolomini*, and *Wallensteins Tod*. *Wallensteins Lager* was acted for the first time at the Weimar theater in October, 1798, and *Die Piccolomini* in January, 1799. In April, 1799, all three pieces were represented, a night being given to each. The work as a whole produced a profound impression, and it is certainly Schiller's masterpiece in dramatic literature.

Wallenstein was received with so much favor that Schiller resolved to devote himself in future mainly to the drama; and in order to be near a theater—partly, too, that he might have more frequent opportunities of intercourse with Goethe—he transferred his residence, in December, 1799, from Jena to Weimar, where he spent the rest of his life. He took with him to Weimar three acts of *Maria Stuart*, and early in the summer of 1800 he finished it at Ettersburg, a country house of the duke of Weimar. The technical qualities of *Maria Stuart* are of the highest order, but the subject does not seem to have interested Schiller very deeply, and it cannot be said either that the characters are finely conceived or that the closing scenes of Queen Mary's life are presented in a truly poetic spirit. In his next play, *Die Jungfrau von Orleans*, completed about a year afterward, Schiller had a more congenial theme, and the vigor with which he handled it commanded the warm admiration of Goethe. In *Die Braut von Messina*, which was acted for the first time at the Weimar theater in March, 1803, Schiller attempted to combine romantic and classical elements. The experiment was not perfectly successful. His last original drama, *Wilhelm Tell*, the first representation of which took place in March, 1804, is in some respects greater than any of those which preceded it, *Wallenstein* excepted.

Besides his complete original plays, Schiller left some dramatic sketches and fragments, the most important of which, *Demetrius*, has been finished in Schiller's manner by several later writers. He also produced German versions of *Macbeth*, of Gozzi's *Turandot*, of two comedies by Picard, and of *Phèdre*. His renderings of Picard's comedies are entitled *Der Parasit* and *Der Neffe als Onkel*.

In his last years Schiller received many tokens of growing fame. In 1802 he was raised to noble rank, and in 1804 he was informed that if he pleased he might be invited to settle in Berlin on advantageous terms. He went with his family to the Prussian capital, but the only result of the negotiations into which he entered was that the duke of Weimar, alarmed at the prospect of losing him, doubled his salary of 400 thalers, ($292). His health was at this time completely undermined, and from the summer of 1804 work was often rendered impossible by serious illness. On the evening of April 29, 1805, he returned from the Weimar theatre in a state of high fever, and from this attack he was unable to rally. He died on May 9, 1805, in his forty-sixth year.

SCHINKEL, Karl Friedrich, architect and painter, and professor in the academy of fine arts at Berlin from 1820, was born at Neuruppin, in Brandenburg, on March 13, 1781, and died at Berlin on October 9, 1841. He is esteemed one of the most original of modern German architects.

SCHIRMER, Friedrich Wilhelm, landscape artist, was born in 1802 in Berlin. In 1831 Schirmer established himself in Berlin in a studio with scholars; in 1839 he was appointed professor of landscape in the academy; in 1845 he again visited Italy, but duties soon brought him back to Berlin. Illness compelled him in 1865 to seek a southern clime; he grew worse in Rome, and died on his way home in 1866.

SCHIRMER, Johann Wilhelm, landscape painter, was born in 1807, at Jülich in Rhenish Prussia. This artist, only a namesake of the preceding, had similar aim and career. In 1854 he was made director of the art school at Carlsruhe, where in 1863 he died.

SCHIZOMYCETES, a term proposed by Nägeli in 1857 to include all those minute organisms known as Bacteria, Microphytes, Microbes, etc., and allied forms. These terms have been used at various times by different authors with widely different meanings in detail, but it is now agreed that the Schizomycetes are minute vegetable organisms devoid of chlorophyll and multiplying by repeated bipartitions. They consist of single cells, which may be spherical, oblong, or cylindrical in shape, or of filamentous or other aggregates of such cells. True spores occur in several, but no trace whatever of sexual organs exists. From their mode of growth, division, and spore-formation (in part), as well as their habit of forming deliquescent, swollen cell-walls, and other peculiarities, there can be no doubt of the close alliance between the Schizomycetes and certain lower *Algæ;* whence both groups have been conjoined under the name *Schizöphyta*. No one character except the want of chlorophyll—which of course entails physiological differences—separates the Schizomycetes from other *Schizophyta;* morphologically and phylogenetically the two groups are united. From this point of view we relegate all the so-called bacteria which contain chlorophyll (*e.g.*, Englemann's *Bacterium chlorinum*, Van Tieghem's *B. viride* and *Bacillus virens*, Cohn's *Micrococcus chlorinus*, etc.) to the *Algæ*. Schizomycetes, then, are saprophytic or parasitic *Schizophyta* devoid of chlorophyll, though they may secrete other coloring matters.

Schizomycetes are ubiquitous in still ponds and ditches, in running streams and rivers, and in the sea, and especially in drains, bogs, refuse heaps, and in the soil, and wherever organic infusions are allowed to stand for a short time. Any liquid (blood, urine, milk, beer, etc.) containing organic matter, or any solid food-stuff (meat, preserves, vegetables, etc.), allowed to stand exposed to the air, soon swarms with bacteria, if moisture is present and the temperature not abnormal.

Little was known about these extremely minute organisms before 1860. Leeuwenhoek figured *Bacteria* as far back as the seventeenth century, and O. F. Müller knew several important forms in 1773, while Ehrenberg in 1830 had advanced to the commencement of a scientific separation and grouping of them, and in 1838 had proposed at least sixteen species, distributing them into four genera. Our modern, more accurate, though still fragmentary knowledge of the forms of Schizomycetes, however, dates from Cohn's brilliant researches, the chief results of which were published at various periods between 1853 and 1872; Cohn's classification of the *Bacteria*, published in 1872 and extended in 1875, has in fact dominated the study of these organisms almost ever since. He proceeded in the main on the assumption that the forms of *Bacteria*, as met with and described by him, are practically constant, at any rate within limits which are not wide; observing that a minute spherical *Micrococcus* or a rod-like *Bacillus* regularly produced similar micrococci and bacilli respectively, he based his classification on what may be considered the constancy of forms which he called species and genera. As to the constancy of form, however, Cohn maintained certain reservations which have been ignored by some of his followers. The fact that Schizomycetes produce spores appears to have been discovered by Cohn in 1857, though it was expressed dubiously in 1872; these spores had, no doubt, been observed previously. In 1876, however, Cohn had seen the spores germinate, and Koch, Brefeld, Pratzmowski, Van Tieghem, De Bary, and others confirmed the discovery in various species.

When Pasteur in 1857 showed that the lactic fermentation depends on the presence of an organism, it was already known from the researches of Schwann (1837) and Helmholtz (1843) that fermentation and putrefaction are intimately connected with the presence of organisms derived from the air, and that the preservation of putrescible substances depends on this principle. In 1862 Pasteur placed it beyond reasonable doubt that the ammoniacal fermentation of urea is due to the action of a minute Schizomycete; in 1864 this was confirmed by Van Tieghem, and in 1874 by Cohn, who named the organism *Micrococcus ureæ*. Pasteur and Cohn also pointed out that putrefaction is but a special case of fermentation, and before 1872 the doctrines of Pasteur were established with respect to Schizomycetes. Meanwhile two branches of inquiry had arisen, so to speak, from the above. In the first place, the ancient question of "spontaneous generation" received fresh impetus from the difficulty of keeping such minute organisms as bacteria from reaching and developing in organic infusions; and, secondly, the long-suspected analogies between the phenomena of fermentation and those of certain diseases again made themselves felt, as both became better understood. Needham in 1745 had declared that heated infusions of organic matter were not deprived of living beings; Spallanzani (1777) had replied that more careful heating and other precautions prevent the appearance of organisms in the fluids. Various experiments by Schwann, Helmholtz, Schultz, Schroeder, Dusch, and others led to the refutation, step by step, of the belief that the more minute organisms, and particularly bacteria, arose *de novo* in the special cases quoted. Nevertheless, instances were adduced where the most carful heating of yolk of egg, milk, hay-infusions, etc., had failed—the boiled infusions, etc., turning putrid and swarming with Schizomycetes after a few hours.

In 1862 Pasteur repeated and extended such experiments, and paved the way for a complete explanation of the anomalies; Cohn in 1872 published confirmatory results; and it became clear that no putrefaction can take place without Schizomycetes. In the hands of Brefeld, Burdon-Sanderson, De Bary, Tyndall, Roberts, Lister, and others, the various links in the chain of evidence grew stronger and stronger, and every case adduced as one of "spontaneous generation" fell to the ground when examined. No case of so-called "spontaneous generation" has withstood rigid investigation; but the discussion contributed to more exact ideas as to the ubiquity, minuteness, and high powers of resistance to physical agents of the spores of Schizomycetes, and led to more exact ideas of antiseptic treatments. Methods were also improved, and the application of some of them to surgery at the hands of Lister, Koch, and others has yielded results of the highest importance.

Long before any clear ideas as to the relations of Schizomycetes to fermentation and disease were possible, various thinkers at different times had suggested that resemblances exist between the phenomena of certain diseases and those of fermentation, and the idea that a virus or contagium might be something of the nature of a minute organism capable of spreading and reproducing itself had been entertained. Such vague notions began to take more definite shape as the ferment theory of Cagniard-Latour (1828), Schwann (1837), and Pasteur made way, especially in the hands of the last-named savant. From about 1870 onward the "germ theory of disease" has passed into acceptance. Rayer in 1850 and Davaine had observed the bacilli in the blood of animals dead of anthrax (splenic fever), and Pollender discovered them anew in 1855. In 1863, imbued with ideas derived from Pasteur's researches on fermentation, Davaine reinvestigated the matter, and put forth the opinion that the anthrax bacilli caused the splenic fever; this was proved to result from inoculation. Koch in 1876 published his observations on Davaine's bacilli, placed beyond doubt their causal relation to splenic fever, discovered the spores and the saprophytic phase in the life-history of the organism, and cleared up important points in the whole question. In 1870 Pasteur had proved that a disease of silkworms was due to a ferment-organism of the nature of a Schizomycete; and in 1871 Oertel showed that a *Micrococcus* already known to exist in diphtheria is intimately concerned in producing that disease. In 1872, therefore, Cohn was already justified in grouping together a number of "pathogenous" Schizomycetes. Thus arose the foundations of the modern "germ theory of disease;" and, in the midst of the wildest conjectures and the worst of logic, a nucleus of facts was won, which has since grown, and is growing daily. Septicæmia, tuberculosis, glanders, fowl-cholera, relapsing fever, and a few other diseases are now brought definitely within the range of biology, and several other contagious and infectious diseases are known to be also due to Schizomycetes.

Other questions of the highest importance have arisen from the foregoing. A few years ago Pasteur showed that *Bacillus anthracis* cultivated in chicken broth, with plenty of oxygen, and at a temperature of 42–43° C., lost its virulence after a few "generations," and ceased to kill even the mouse; Toussaint and Chaveau confirmed, and others have extended, the observations. More remarkable still, animals inoculated with such "attenuated" bacilli proved to be curiously resistent to the deadly effects of subsequent inoculations of the non-attenuated form. In other words, animals vaccinated with the cultivated bacillus showed immunity from disease when reinoculated with the deadly wild form. The questions as to the causes and nature of the changes in the bacillus and in the host, as to the extent of immunity enjoyed by the latter, etc., are now burning—Metschnikoff's recent observations (1884), showing that the white corpuscles eliminate the bacilli from the blood, being one of the most startling contributions to the answers.

Another burning question has already been in part touched upon. Experiments have shown that Schizomycetes are pleomorphic; they are also very sensitive, so to speak, to the influences of the environment. The investigations of Cohn, Pasteur, Koch, Nägeli, Kurth, De Bary, and others leave no doubt that many Schizomycetes are sensibly affected by the media in which they are cultivated: not only are the forms modified, but also the physiological activity varies in degree, and even in kind. These and similar facts seem to be largely responsible for recent ideas as to the possibility of being able to cultivate or "educate" certain Schizomycetes. One case only need be referred to. *Bacillus anthracis* and *B. subtilis* are only distinguishable with great difficulty morphologically; the former is parasitic in its vegetative stages, the latter is always a saprophyte. Now *B. anthracis*, as said, can become harmless by cultivation, and so it has been thought that the two forms were convertible. Buchner even went so far as to declare that he had transformed *B. anthracis* into *B. subtilis*, *i.e.*, that the differences which botanists detect are only due to the influence of the environment at the time. These assertions cannot be regarded as proved; but the question whether harmless forms can become educated, as it were, to a parasitic mode of life within periods which we can control is of course of the highest importance. Such are a few of the questions now under discussion, together with others as to the mode of action of pathogenic Schizomycetes, as to the nature of immunity, and as to the limitation of "species" among such simple forms.

SCHLAGINTWEIT-SAKÜNLÜNSKI, Hermann von, the eldest of a band of brothers, all more or less noted as scientific explorers or students of foreign countries, sons of an oculist of Munich, was born on May 13, 1826. His first scientific labors were studies in the Alps, carried on between 1846 and 1848, in association with his brother Adolf. The publication of the *Studien über die physikalische Geographie der Alpen* in 1850 founded the scientific reputation of the two brothers. Soon after the publication of the *Neue Untersuchungen über die phys. Geog. u. Geol. der Alpen* (1854, 4to), the three brothers, Hermann, Robert and Adolf, received, on the recommendation of Alex. von Humboldt, a commission from the East India Company to travel for scientific purposes in their territory. Their explorations extended over the period 1854–57. Between 1860 and 1866 Hermann and Robert published in four volumes the *Results of a Scientific Mission to India and High Asia.* Hermann spent the last years of his life chiefly in literary and scientific activity, partly at Munich, partly at the castle of Jägernburg near Forchheim. He died at Munich on January 19, 1882.

SCHLANGENBAD. See Schwalbach.

SCHLEGEL, August Wilhelm von, German poet, translator, and critic, was born on September 8, 1767, at Hanover. Schlegel was made a professor at the university of Bonn in 1818, and during the remainder of his life he occupied himself chiefly with Oriental studies, although he continued to lecture on art and literature, and in 1828 he issued two volumes of critical writings. In 1823–30 he published the *Indische Bibliothek;* and as separate works appeared (1823) the *Bhagavad-Gîta*, with a Latin translation, and (1829) the *Râmâjana.* He died at Bonn on May 12, 1845.

SCHLEGEL, Johann Elias, a German dramatic writer, was born at Meissen on January 28, 1718. He was educated at Schulpforta and at the university of Leipsic. In 1743, having finished his studies, he became private secretary to his relative, Von Spener, the Saxon ambassador at the Danish court. Afterward he was made professor extraordinary at the academy of Soröe, where he died August 13, 1749.

SCHLEGEL, Karl Wilhelm Friedrich von, known chiefly as an historian of literature, was the brother of August Wilhelm von Schlegel. He was born at Hanover on March 10, 1772. Having studied at Göttingen and Leipsic, he attracted some attention by a book on the *Griechen und Römer* (1797), which was praised by Heyne. This work was soon followed by his *Geschichte der Poesie der Griechen und Römer.* He went to Vienna in 1808, and in the following year was engaged as imperial court secretary at the headquarters of the archduke Charles. At a later period he was for some time councilor of legation in the Austrian embassy at the Frankfort diet, but in 1818 he returned to Vienna. Meanwhile he had published two series of lectures. After his return to Vienna from Frankfort he edited *Concordia*, and began the issue of his *Sämmtliche Werke.* He also delivered lectures, which were republished in his *Philosophie des Lebens* (1828) and in his *Philosophie der Geschichte* (1829). He died on January 11, 1829, at Dresden.

SCHLEICHER, August, born at Meiningen on February 19, 1821, studied at the universities of Leipsic and Tübingen, became extraordinary professor of philology in Prague in 1850, removed to Jena as ordinary professor in 1857, and died there December 6, 1868.

SCHLEIDEN, Matthias, German botanist, was born at Hamburg in 1804. He studied law at Heidelberg and practiced as advocate in Hamburg till 1831, but not succeeding he studied botany and medicine at Göttingen and Berlin, and graduated in Jena in 1839, where he afterward became professor of botany (1846–50). In 1863 he was called to Dorpat, but resigned the following year and returned to Germany, where he lived as a private teacher. He died at Frankfurt in 1881.

SCHLEIERMACHER, Friedrich Daniel Ernst, theologian and philosopher, was the son of a Prussian army-chaplain of the Reformed confession, and was born November 21, 1768, at Breslau. When Schleiermacher entered the university of Halle (1787) the reign of pietism there had ceased, having given way to the rationalistic philosophy of Wolf with the critical theology of Semler, though the new philosophy of Kant was rapidly displacing Wolf's. As a student he pursued an independent course of reading and neglected to his permanent loss the study of the Old Testament and the Oriental languages. But he frequented the lectures of Semler and J. A. Eberhard, acquiring from the former the principles of an independent criticism of the New Testament and from the latter his love of Plato and Aristotle. At the same time he studied with great earnestness the writings of Kant and Jacobi.

After short engagements in tuition and as *locum tenens* to a clergyman of the small town of Landsberg, he received (1796) the appointment of chaplain to the Charité Hospital in Berlin, a position which he held nearly six years, but which offered no scope for the development of his powers as a preacher. He was the more induced to seek the satisfaction of his mental and spiritual necessities in the cultivated society of Berlin, and in profound philosophical studies. This was the period in which he was constructing the framework of his philosophical and religious system. It was the period, too, when he made himself widely acquainted with art, literature, science, and modern culture generally. The literary fruit of this period of intense fermentation and of rapid development was his "epoch-making" book, *Reden über die Religion* (1799), and his "new year's gift" to the new century, the *Monologen* (1800). In 1802, to his great advantage morally and intellectually, Schleiermacher exchanged the brilliant circle of Berlin Romanticists for the retired life of a pastor in the little Pomeranian town of Stolpe. Here he remained two years, which were full of pastoral and literary work, as well as rich in personal and moral progress. He relieved Friedrich Schlegel entirely of his nominal responsibility for the translation of *Plato*, which they had together undertaken, and regarded the completion of it as the work of his life. The first volume was published in 1804, and the last (the *Republic*) in 1828. At the same time another work, *Grundlinien einer Kritik der bisherigen Sittenlehre* (1803), the first of his strictly critical and philosophical productions, occupied him. In 1804 Schleiermacher removed as university preacher and professor of theology to Halle, where he remained until 1807. In this period he wrote his dialogue, the *Weihnachtsfeier* (1806). After the battle of Jena he returned to Berlin (1807), was soon appointed pastor of the Trinity Church there, and the next year married the widow of his friend Willich. At the foundation of the Berlin university (1810), in which he took a prominent part, he was called to a theological chair, and soon became secretary to the Academy of Sciences. The twenty-four years of his professional career in Berlin were opened with his short but important outline of theological study (*Kurze Darstellung des theologischen Studiums*, 1810), in which he sought to do for theology what he had done for religion in his *Reden.*

At the same time he prepared for the press his chief theological work, *Der christliche Glaube nach den Grundsätzen der evangelischen Kirche.* The fundamental principle of this classical work is, that religious feeling, the sense of absolute dependence on God as communicated by Jesus Christ through the church, and not the creeds or the letter of Scripture or the rationalistic understanding, is the source and law of dogmatic theology. The work is therefore simply a description of the facts of religious feeling, or of the inner life of the soul in its relations to God, and these inward facts are looked at in the various stages of their development and presented in their systematic connection. The aim of the work was to reform Protestant theology by means of the fundamental ideas of the *Reden*, to put an end to the unreason and superficiality of both supernaturalism and rationalism, and to deliver religion and theology from a relation of dependence on perpetually changing systems of philosophy. Though the work added to the reputation of its author, it naturally aroused the increased opposition of the theological schools it was intended to overthrow, and at the same time Schleiermacher's defense of the right of the church to frame its own liturgy in opposition to the arbitrary dictation of the monarch or his ministers brought upon him fresh troubles. He felt himself in Berlin more and more isolated, although his church and his lecture-room continued to be largely attended. But he prosecuted his translation of Plato and prepared a new and greatly altered edition of his *Christliche Glaube*, anticipating the latter in two letters to his friend Lücke (in the *Studien und Kritiken*, 1829), in which he defended with a masterly hand his theological position generally and his book in particular against opponents on the right and the left. The same year he lost his only son—a blow which, he said, "drove the nails into his own coffin." But he continued to defend his theological position against Hengstenberg's party on the one hand and the rationalists Von Cölln and D. Schulz on the other, protesting against both subscription to the ancient creeds and the imposition of a new rationalistic formulary. In the midst of such labors, and enjoying still full bodily and mental vigor, he was carried off after a few days illness by inflammation of the lungs. He died thinking "the profoundest speculative ideas which were one with his deepest religious feeling," and partaking of the sacrament of the Lord's supper, February 12, 1834.

SCHLESWIG (Danish *Slesvig*), the capital of the Prussian province of Schleswig-Holstein, is situated at the west end of the long narrow arm of the sea called the Schlei, thirty miles to the northwest of Kiel. The town consists mainly of a single street, three and one-half miles long, forming a semicircle round the Schlei, and is divided into the Altstadt (with the Holm), the Lollfuss, and the Friedrichsberg. The population in 1385 was 15,187, all Protestants except about 250 Roman Catholics and 70 Jews.

SCHLESWIG-HOLSTEIN, a maritime province in the northwest of Prussia, formed out of the once Danish duchies of Schleswig-Holstein and Lauenburg, is bounded on the west by the German Ocean, on the north by Jutland, on the east by the Baltic Lübeck and Mecklenburg, and on the south by Mecklenburg and the lower course of the Elbe (separating it from Hanover). It thus consists of the southern half of the Cimbric peninsula, and forms the connecting link between Germany and Denmark. In addition to the mainland, which decreases in breadth from south to north, the province includes several islands, the most important being Alsen and Fehmarn in the Baltic, and Röm, Sylt, and Föhr in the North Sea. The total area of the province is 7,280 square miles, 450 of which belong to the small duchy of Lauenburg in the southeast corner, while the rest are divided almost equally between Holstein to the south of the Eider and Schleswig to the north of it. From north to south the province is about 140 miles long, while its breadth varies from 90 miles in Holstein to 35 miles at the narrow parts of Schleswig.

Of the total area of the province 58.3 per cent. is occupied by tilled land, 28.5 per cent. by meadows and pastures, and only 6.4 per cent. by forests. The ordinary cereals are all cultivated with success and there is generally a considerable surplus for exportation; rape is grown in the marsh lands and flax on the east coast, while large quantities of apples and other fruit are raised near Altona for the Hamburg and English markets. The marsh lands afford admirable pasture, and a greater proportion of cattle (65 per 100 inhabitants) is reared in Schleswig-Holstein, mainly by small owners, than in any other Prussian province. Great numbers of fat cattle are exported to England. The Holstein horses are also in request, but sheep-farming is comparatively neglected. Bee-keeping is found a productive industry. The hills skirting the bays of the Baltic coast are generally pleasantly wooded, but the forests are nowhere of great extent except in the duchy of Lauenburg. The fishing in the Baltic is productive; Eckernförde is the chief fishing station in Prussia. The oysters from the beds on the west coast of Schleswig are widely known under the misnomer of "Holstein natives." The mineral resources of the province are almost confined to a few layers of rock-salt near Segeberg. The manufacturing industry is also insignificant and does not extend much beyond the large towns, such as Altona, Kiel, and Flensburg. The shipbuilding of Kiel and other seaports is, however, important; and lace is made by the peasants of North Schleswig. The commerce and shipping of Schleswig-Holstein, stimulated by its position between two seas, as well as by its excellent harbors and waterways, are much more prominent than its manufactures. Kiel is the chief seaport of Prussia, while an oversea trade is also carried on by Altona and Flensburg. The main exports are grain, cattle, horses, fish, and oysters, in return for which come timber, coal, salt, wine, and colonial produce.

The population of the province in 1880 was 1,127,149, comprising 1,111,383 Protestants, 8,903 Roman Catholics, and 3,522 Jews. The urban and rural communities are in the proportion of 4 to 6. About 38 per cent. of the population are supported by agriculture, 26 per cent. by manufacturing industry, 10 per cent. by trade, while 12 per cent. are domestic servants and day-laborers; 6 per cent. are absorbed by the official and professional classes, and 5½ per cent. by those who returned no occupation. The great bulk of the Holsteiners and more than half the Schleswigers are of genuine German stock, but there are about 150,000 Danes in the north part of Schleswig. Among the Germans the prevalent tongue is Low German, but the North Frisians on the west coast of Schleswig and the North Sea islands (about 30,000 in all) still speak a Frisian dialect, which, however, is gradually dying out. The peninsula of Angeln, between the Gulf of Flensburg and the Schlei, is supposed to have been the original seat of the English, and most observers profess to see a striking resemblance between this district and the counties of Kent and Surrey. The peasants of Dithmarschen also retain many of their ancient peculiarities. The boundary between the Danish and German languages is approximately a line between Flensburg and Tondern; not more than 15 per cent. of the entire population of the province speak Danish as their mother tongue. The chief educational institution in Schleswig-Holstein is the university of Kiel. Schleswig is the official capital of the province, but Altona and Kiel are the largest towns, the former being also the headquarters of an army corps and the latter the chief naval station of Germany. Kiel and Friedrichsort are fortified, and the old lines of Düppel are also maintained. The province sends ten members to the reichstag and nineteen to the Prussian house of deputies. The provincial estates meet in Rendsburg.

SCHLETTSTADT, a small town in Lower Alsace, stands on the Ill, twenty-six miles to the south of Strasburg. It possesses two fine churches, relics of a period of former importance, and carries on manufactures of wire gauze, and a considerable trade in country produce. The population in 1880 was 8,979.

SCHLÖZER, August Ludwig von, German historian, was born at Gaggstedt, in the county of Hohenlohe-Kirchberg, on July 5, 1735. He began his career at Göttingen in 1767, and soon ranked among the foremost historical writers of his day. His most important works were his *Allgemeine nordische Geschichte* (1772) and his translation of the Russian chronicler Nestor to the year 980 (1802–9). He awoke much intelligent interest in universal history by his *Weltgeschichte im Auszuge und Zusammenhange* (1792–1801); and in several works he helped to lay the foundations of statistical science. He also produced a strong impression by his political writings, the *Briefwechsel* (10 vols., 1776–82) and the *Staatsanzeigen* (18 vols., 1782–93). In 1804 he was ennobled by the emperor of Russia. He withdrew from active life in 1805, and died on September 9, 1809.

SCHMALKALDEN, a town of Prussia, in the province of Hesse-Nassau, lies about thirty miles to the southwest of Erfurt, and in 1885 contained 6,788 inhabitants, chiefly employed in the manufacture of hardware articles. It still possesses the inn in which the important Protestant League of Schmalkalden or Smalkald was concluded in 1531, and also the house in which the articles were drawn up in 1537 by Luther, Melanchthon, and other Reformers.

SCHNEIDEMÜHL (Polish *Pila*), a small town of Prussia, in the province of Posen, lies on the Cüddow, 45 miles north of Posen, and 140 miles east-by-north of Berlin. It is a railway junction of some importance, carries on a trade in wood, grain, and potatoes, and possesses an iron foundry, several glass works and machine-shops, and other industrial establishments. In 1885 the population was 12,259, of whom 7,700 were Protestants, and about 1,000 Poles.

SCHNORR VON KAROLSFELD, Julius, of a family of artists, was born in 1794 at Leipsic. In 1818 he followed the founders of the new school of German pre-Raphaelites in the general pilgrimage to Rome. The school of religious and romantic art abjured modern styles with three centuries of decadence, and reverted to and revived the principles and practice of earlier periods. At the outset an effort was made to recover fresco painting and "monumental art," and Schnorr soon found opportunity of proving his powers, when commissioned to decorate with frescoes, illustrative of Ariosto, the entrance hall of the Villa Massimo, near the Lateran. His second period dates from 1825, when he left Rome, settled in Munich, entered the service of King Louis, and transplanted to Germany the art of wall-painting learnt in Italy. Schnorr's third period is marked by his "Bible Pictures" or Scripture History in 180 designs. The completion of the arduous work was celebrated in 1862 by the artists of Saxony with a festival, and other German states offered congratulations and presented gifts. Schnorr's busy life closed at Munich in 1872.

SCHOLASTICISM is the name usually employed to denote the most typical products of mediæval thought. The final disappearance of ancient philosophy may be dated about the beginning of the sixth century of our era. Boetius, its last representative in the West, died in 525, and four years later the Athenian schools were closed by order of the emperor Justinian. Before this time Christian thought had already been active in the fathers of the church, but their activity had been entirely devoted to the elaborating and systematizing of theological dogmas. Although the dogmas unquestionably involve philosophical assumptions, the fathers deal with them throughout simply as churchmen, and do not profess to supply for them a philosophical or rational basis. Only incidentally do some of them—like Augustine, for example—digress into strictly philosophical discussion. After the centuries of intellectual darkness, during which the settlement of the new races and their conversion to Christianity proceeded and the foundations of the modern European order were being laid, the first symptoms of renewed intellectual activity appear contemporaneously with the consolidation of the empire of the West in the hands of Charlemagne. That enlightened monarch endeavored to attract to his court the best scholars of Britain and Ireland (where the classical tradition had never died out), and by imperial decree (787) commanded the establishment of schools in connection with every abbey in his realms. Peter of Pisa and Alcuin of York were his advisers in directing this great work, and under their fostering care the opposition long supposed to exist between godliness and secular learning speedily disappeared. Besides the celebrated school of the Palace, where Alcuin had among his hearers the members of the imperial family and the dignitaries of the empire as well as talented youths of humbler origin, we hear of the episcopal schools of Lyons, Orleans, and St. Denis, the cloister schools of St. Martin of Tours, of Fulda, Corbie, Fontenelle, and many others, besides the older monasteries of St. Gall and Reichenau. These schools became the center of mediæval learning and speculation, and from them the name Scholasticism is derived. They were designed to communicate instruction in the seven liberal arts which constituted the educational curriculum of the Middle Ages—grammar, dialectic, and rhetoric forming the trivium of arts proper, while geometry, arithmetic, astronomy, and music constituted the quadrivium of the sciences. The name *doctor scholasticus* was applied originally to any teacher in such an ecclesiastical gymnasium, but, as the study of dialectic or logic soon became the object of absorbing interest to the best intellects of the time, it tended to overshadow the more elementary disciplines, and the general acceptation of "doctor" came to be one who occupied himself with the teaching of logic and the discussion of the philosophical questions arising therefrom. The philosophy of the later Scholastics is more extended in its scope; but to the very end of the mediæval period philosophy centers in the discussion of the same logical problems which began to agitate the teachers of the ninth and tenth centuries.

Scholasticism in the widest sense thus extends from the ninth to the end of the fourteenth or the beginning of the fifteenth century—from Erigena to Occam and his followers. The belated Scholastics who lingered beyond the last-mentioned date served only as marks for the obloquy heaped upon the schools by the men of the new time. But, although every systematic account of Scholasticism finds it necessary to begin with Erigena, that philosopher is of the spiritual kindred of the Neoplatonists and Christian mystics rather than of the typical Scholastic doctors. In a few obscure writings of the ninth century we find the beginnings of discussion upon the logical questions which afterward proved of such absorbing interest; but these are followed by the intellectual interregnum of the tenth century. The activity of Scholasticism is therefore mainly confined within the limits of the eleventh and fourteenth centuries. It is clearly divisible (by circumstances to be presently explained) into two well-marked periods,—the first extending to the end of the twelfth century and embracing as its chief names Roscellinus, Anselm, William of Champeaux, and Abelard, while the second extended from the beginning of the thirteenth century to the Renaissance and the general distraction of men's thoughts from the problems and methods of Scholasticism. In this second period the names of Albertus Magnus, Thomas Aquinas, and Duns Scotus represent (in the thirteenth century and the first years of the fourteenth century) the culmination of Scholastic theory and its consolidation into system.

It is a remark of Prantl's that there is no such thing as philosophy in the Middle Ages; there are only logic and theology. If pressed literally the remark is hypercritical, for it overlooks two facts—in the first place that the main objects of theology and philosophy are identical, though the method of treatment is different; and in the second place that logical discussion commonly leads up to metaphysical problems, and that this was pre-eminently the case with the logic of the Schoolmen. But the saying draws attention in a forcible way to the two great influences which shaped mediæval thought—on the one side the traditions of ancient logic, on the other the system of Christian theology. Scholasticism opens with a discussion of certain points in the Aristotelian logic; it speedily begins to apply its logical distinctions to the doctrines of the church; and when it attains its full stature in St. Thomas it has, with the exception of certain mysteries, rationalized or Aristotelianized the whole churchly system. Or we might say with equal truth that the philosophy of St. Thomas is Aristotle Christianized. It is, moreover, the attitude of the Schoolmen to these two influences that yields the general characteristic of the period. Their attitude throughout is that of interpreters rather than of those conducting an independent investigation. And though they are at the same time the acutest of critics, and offer the most ingenious developments of the original thesis, they never step outside the charmed circle of the system they have inherited. They appear to contemplate the universe of nature and man not at first hand with their own eyes but in the glass of Aristotelian formulæ. Their chief works are in the shape of commentaries upon the writings of "the philosopher." Their problems and solutions alike spring from the master's dicta—from the need of reconciling these with one another and with the conclusions of Christian theology.

The fact that the channels of thought during the Middle Ages were determined in this way by the external influence of a twofold tradition is usually expressed by saying that reason in the Middle Age is subject to authority. It has not the free play which characterizes its activity in Greece and in the philosophy of modern times. Its conclusions are predetermined, and the initiative of the individual thinker is almost confined, therefore, to formal details in the treatment of his thesis. From the side of the church this characteristic of the period is expressed in the saying that reason has its proper station as the handmaid of faith (*ancilla fidei*). But it is only fair to add that this principle of the subordination of the reason wears a different aspect according to the century and writer referred to. In Scotus Erigena, at the beginning of the Scholastic era, there is no such subordination contemplated, because philosophy and theology in his work are in implicit unity. According to his memorable expression, "Conficitur inde veram esse philosophiam veram religionem, conversimque veram religionem esse veram philosophiam" (*De Divisione Naturae*, i. 1). Reason in its own strength and with its own instruments evolves a system of the universe which coincides, according to Erigena, with the teaching of Scripture. For Erigena, therefore, the speculative reason is the supreme arbiter (as he himself indeed expressly asserts); and in accordance with its results the utterances of Scripture and of the church have not infrequently to be subjected to an allegorical or mystical interpretation. But this is only to say again in so many words that Erigena is more of a Neoplatonist than a Scholastic. In regard to the Scholastics proper, Cousin suggested in respect of this point a threefold chronological division—at the outset the absolute subordination of philosophy to theology, then the period of their alliance, and finally the beginning of their separation. In other words, we note philosophy gradually extending its claims. Dialectic is, to begin with, a merely secular art, and only by degrees are its terms and distinctions applied to the subject-matter of theology. The early results of the application, in the hands of Berengarius and Roscellinus, did not seem favorable to Christian orthodoxy. Hence the strength with which a champion of the faith like Anselm insists on the subordination of reason. To Bernard of Clairvaux and many other conservative churchmen the application of dialectic to the things of faith at all appears as dangerous as it is impious. At a later date, in the systems of the great Schoolmen, the rights of reason are fully established and amply acknowledged. The relation of reason and faith remains, it is true, an external one, and certain doctrines—an increasing number as time goes on—are withdrawn from the sphere of reason. But with these exceptions the two march side by side; they establish by different means the same results. For the conflicts which accompanied the first intrusion of philosophy into the theological domain more profound and cautious thinkers with a far ampler apparatus of knowledge had substituted a harmony. "The constant effort of Scholasticism to be at once philosophy and theology" seemed at last satisfactorily realized. But this harmony proved more apparent than real, for the further progress of Scholastic thought consisted in a withdrawal of doctrine after doctrine from the possibility of rational proof and their relegation to the sphere of faith. Indeed, no sooner was the harmony apparently established by Aquinas, than Duns Scotus began this negative criticism, which is carried much farther by William of Occam. But this is equivalent to a confession that Scholasticism had failed in its task, which was to rationalize the doctrines of the church. The two authorities refused to be reconciled. The Aristotelian form refused to fit a matter for which it was never intended; the matter of Christian theology refused to be forced into an alien form. The Scholastic philosophy speedily ceased therefore to possess a *ráison d'être*, and the spread of the skeptical doctrine of a twofold truth proclaims the destruction of the fabric erected by mediæval thought. The end of the period was thus brought about by the internal decay of its method and principles quite as much as by the variety of external causes which contributed to transfer men's interests to other subjects.

But, although the relation of reason to an external authority thus constitutes the badge of mediæval thought, it would be in the last degree unjust to look upon Scholasticism as philosophically barren, and to speak as if reason, after an interregnum of 1,000 years, resumed its rights at the Renaissance. Such language was excusable in the men of the Renaissance, fighting the battle of classic form and beauty and of the many-sidedness of life against the barbarous terminology and the monastic ideals of the schools, or in the protagonists of modern science protesting against the complete absorption of human talent by metaphysics—an absorption never witnessed to the same extent before or since. The new is never just to the old; we do not expect it to be so. It belongs to a later and calmer judgment to recognize how the old contained in itself the germs of the new; and a closer study of history is invariably found to diminish the abruptness of the picturesque new buildings which furnish forth our current divisions of epochs and periods. In the schools and universities of the Middle Age the intellect of the semi-barbarous European peoples had been trained for the work of the modern world. It had advanced from a childish rudeness to an appreciation of the subtlest logical and metaphysical distinctions. The debt which modern philosophy owes to the Schoolmen for this formal training has been amply acknowledged even by a writer like J. S. Mill. But we may go further and say that, in spite of their initial acceptance of authority, the Scholastics are not the antagonists of reason; on the contrary they fight its battles. As has often been pointed out, the attempt to establish *by argument* the authority of faith is in reality the unconscious establishment of the authority of reason. Reason if admitted at all, must ultimately claim the whole man. Anselm's motto, *Credo ut intelligam*, marks well the distance that has been traversed since Tertullian's *Credo quia absurdum est.* The claim of reason has been recognized to manipulate the data of faith, at first blindly and immediately received, and to weld them into a system such as will satisfy its own needs. Scholasticism that has outlived its day may be justly identified with obscurantism, but not so the systems of those who, by their mighty intellectual force alone, once held all the minds of Europe in willing subjection. The scholastic systems, it is true, are not the free products of speculation; in the main they are *summæ theologiæ*, or they are modified versions of Aristotle. But each system is a fresh recognition of the rights of reason, and Scholasticism as a whole may be justly regarded as the history of the growth and gradual emancipation of reason which was completed in the movements of the Renaissance and the Reformation. Indeed, the widening of human interests which then took place is not without its prelude in the systems of the second period of Scholasticism. The complementary sciences of theology and philosophy remain, of course, the central and dominating interest; but Albertus Magnus was keenly interested in natural science, and a system like that of Aquinas is as wide as Aristotle's in its range, and holds no part of nature to lie outside of its inquiries.

In speaking of the origin of Scholasticism—name and thing—it has been already noted that mediæval speculation takes its rise in certain logical problems. To be more precise, it is the nature of "universals" which forms the central theme of Scholastic debate. This is the case almost exclusively during the first period, and only to a less extent during the second, where it reappears in a somewhat different form as the difficulty concerning the principle of individuation. Otherwise expressed, the question on which centuries of discussion were thus expended concerns the nature of genera and species and their relation to the individual. On this, Nominalists and Realists take opposite sides; and, exclusively logical as the point may at first sight seem to be, adherence to one side or the other is an accurate indication of philosophic tendency. The two opposing theories express at bottom, in the phraseology of their own time, the radical divergence of pantheism and individualism—the two extremes between which philosophy seems pendulum-wise to oscillate, and which may be said still to await their perfect reconciliation.

SCHOMBERG, Frederick Armand, Duke of, marshal of France and English general, was descended from an old family of the Palatinate, and was born about 1619. He began his military career under Frederick Henry, prince of Orange, and after his death in 1659 entered the service of France, acquiring ultimately a reputation as a general second only to that of Turenne and the prince of Condé. In Paris he made the acquaintance of Charles II., who according to his own account "admitted him to great familiarities with him." Ultimately he was chosen commander-in-chief of the forces of the elector of Brandenburg, and with the elector's consent he joined the prince of Orange on his expedition to England in 1688, as second in command to the prince. The following year he was made a knight of the Garter, created successively baron, marquis, and duke, and received from the House of Commons a vote of £100,000. In August he was appointed commander-in-chief of the expedition to Ireland against James II. At the Boyne (July 1, 1690) Schomberg gave his opinion against the determination of William to cross the river in face of the opposing army. In the battle he held command of the center, and, while riding through the river without his cuirass to rally his men, was surrounded by a band of Irish horsemen and met instantaneous death.

SCHÖNBEIN, CHRISTIAN FRIEDRICH, from 1828 professor of chemistry at Basel, is known as the discoverer of OZONE, (*q.v.*)

SCHÖNEBECK, a town of Prussian Saxony, on the left bank of the Elbe, nine miles above Magdeburg. It contains manufactories of chemicals, machinery, percussion caps, starch, white lead, and various other articles, but is chiefly noted for its extensive salt springs and works, which produce about 70,000 tons of salt per annum. In 1885 Schönebeck contained 13,316 inhabitants (including the adjoining communities of Salze, Elmen, and Frohse, about 20,000).

SCHÖNEBERG, a so-called Prussian "village," in the province of Brandenburg, is now really a suburb of Berlin, which it adjoins on the southwest. It contains the royal botanic garden, a large maison de santé, and manufactories of paper collars, enamels, railway rolling-stock, and chemicals. The population in 1880 was 11,180.

SCHONGAUER, or SHOEN, MARTIN, the most able engraver and painter of the early German school. Schongauer established at Colmar a very important school of engraving, out of which grew the "little masters" of the succeeding generation, and a large group of Nuremberg artists. Among the very few paintings which can with certainty be attributed to him, the chief is a magnificent altarpiece in the church of St. Martin, at Colmar, representing the Virgin and Child, crowned by Angels, with a background of roses —a work of the highest beauty, and large in scale, the figures being nearly life size. In 1488 Schongauer died at Colmar, according to the register of St. Martin's church.

SCHOOLCRAFT, HENRY ROWE, a North American traveler, ethnologist, and author, was born March 28, 1793, at Watervliet (now called Guilderland), Albany county, N. Y., and died at Washington December 10, 1864. After studying chemistry and mineralogy at college he had several years' experience of their practical application, especially at a glass-factory of which his father was manager, and in 1817 published his *vitreology*. In the following year he was appointed to the Geological Survey of Missouri and Arkansas, and in 1819 he published his *View of the Lead Mines of Missouri*. In 1832 he ascertained the real source of the Mississippi to be Lake Itasca.

SCHOOLS AND COMMON SCHOOLS. See EDUCATION, BLIND, DEAF AND DUMB, CONSERVATORY, etc., and the relative sections of the articles on individual countries and States.

SCHOOLS OF PAINTING. The word "school" as applied to painting is used with various more or less comprehensive meanings. In its widest sense it includes all the painters of one country, of every date—as, for example, "the Italian school." In its narrowest sense it denotes a group of painters who all worked under the influence of one man—as, for example, "the school of Raphael." In a third sense it is applied to the painters of one city or province who for successive generations worked under some common local influence, and with some general similarity in design, color, or technique—as, for example, "the Florentine school," "the Umbrian school." For many reasons the existence of well-defined schools of painting is now almost wholly a thing of the past, and the conditions under which the modern artist gains his education, finds his patrons, and carries out his work have little in common with those which were prevalent throughout the Middle Ages. Painters in the old time were closely bound together as fellow-members of a painters' guild, with its clearly defined set of rules and traditions; moreover, the universal system of apprenticeship, which compelled the young painter to work for a term of years in the *bottega* or studio of some established freedman of the guild, frequently caused the impress of the genius of one man to be very clearly stamped on a large number of pupils, who thus all picked up and frequently retained for life certain tricks of manner or peculiarities of method which often make it difficult to distinguish the authorship of a special painting.

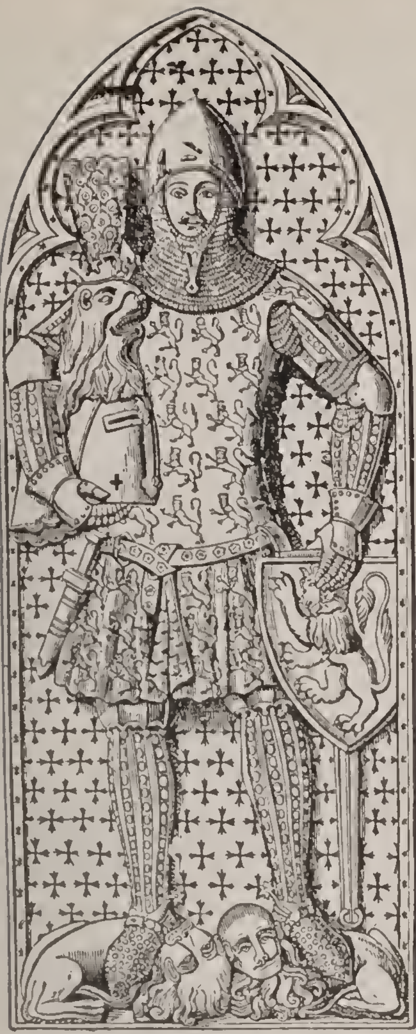
1. *Italian.*

In Italy, as in other parts of Europe, the Byzantine school of painting was for many centuries universally prevalent, and it was not till quite the end of the thirteenth century that one man of extraordinary talent—Giotto—broke through the long-established traditions and inaugurated the true Renaissance of this art. According to Vasari, it was Cimabue who first ceased to work in the Byzantine manner; but the truth is that his pictures, though certainly superior to those of his predecessors, are thoroughly characteristic specimens of the Byzantine style. Ghiberti, in his *Commentary* (a century earlier than Vasari's work), with greater accuracy remarks that both Duccio of Siena and Cimabue worked in the Byzantine manner, and that Giotto was the first who learnt to paint with naturalistic truth.

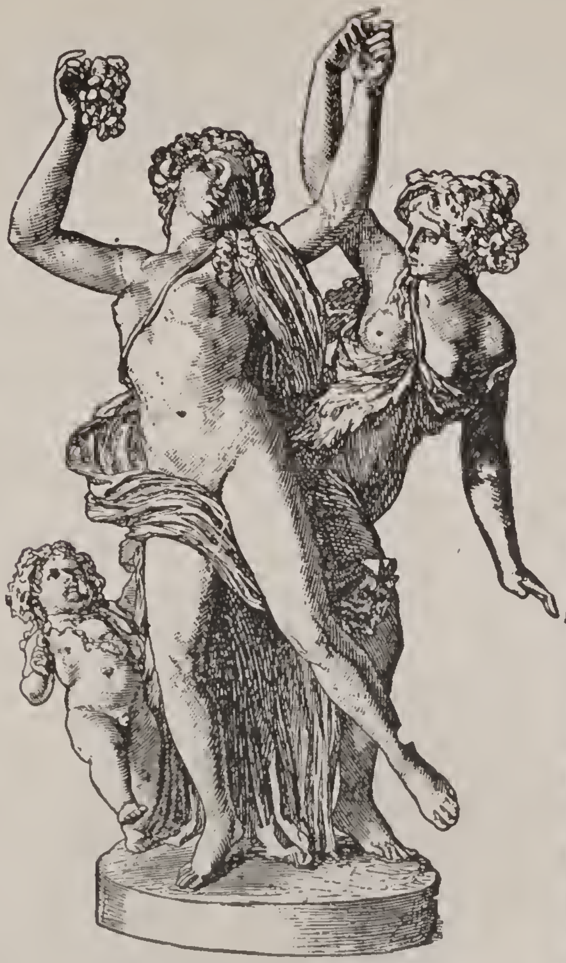
In the twelfth and early part of the thirteenth century Pisa and Lucca were the chief seats of what rude painting then existed in Italy. A number of works of this date still exist, chiefly painted Crucifixions treated in the most conventional Byzantine manner. Giunta Pisano, who was painting in the first half of the thirteenth century, was a little superior to the otherwise dead level of hieratic conventionalism. He is said to have been Cimabue's master. In the fourteenth century painting in Pisa was either Florentine or Sienese in style.

No city, not even Florence, was so fertile as Siena in native painters during the thirteenth and fourteenth centuries. The earliest, working before 1300, did not emancipate themselves from the old Byzantine mannerism; Guido da Siena, Duccio (see fig. 1), and Segna di Buoninsegna possessed many of the peculiarities of the old school—its rigid attitudes, its thin stiff folds, and its greenish shadows in the flesh tints. In the first half of the fourteenth century a number of very able painters were carrying on at Siena a parallel development to that which Giotto had inaugurated at Florence; chief among them were Simone di Martino, Lippo Memmi, and especially Ambrogio Lorenzetti, a painter of both panels and large frescoes, which show rich and noble imaginative power and much technical skill. It is important to note that Ambrogio and probably other painters of his time were, like the earlier Pisan Niccola, beginning to study the then rare examples of classical sculpture. Ghiberti, in his *Commentary*, speaks with enthusiasm of the beauty of an antique statue which he knew only from a drawing by Ambrogio Lorenzetti. In the second half of the fourteenth century, Siena produced a large number of more mediocre painters; but these were succeeded by an abler generation, among

PAINTING AND SCULPTURE



Sepulchral effigy in low relief of Gunther of Schwarzburg (d. 1349), in Frankfort cathedral.



Bacchanal group by Clodion in terra-cotta.

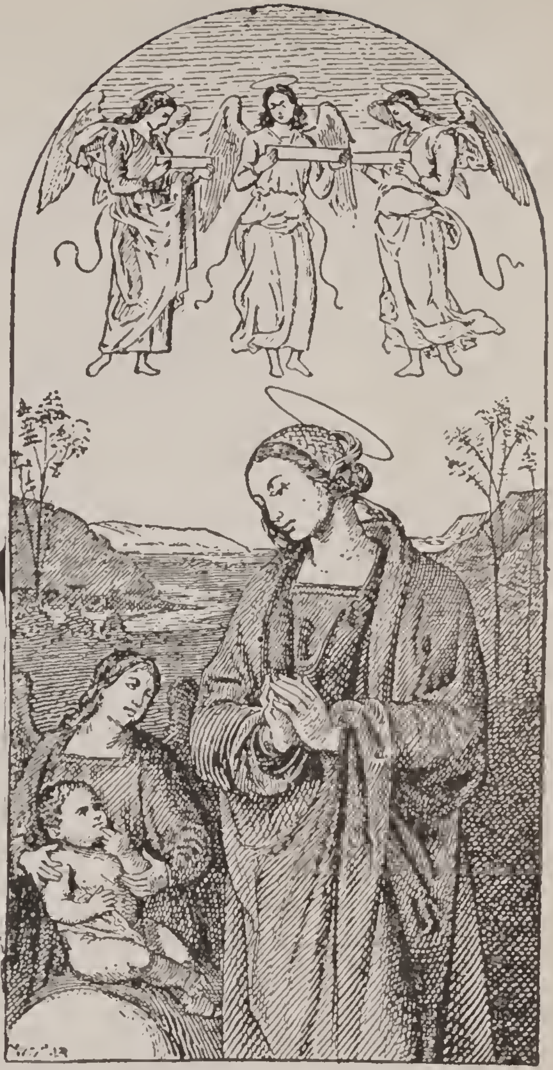
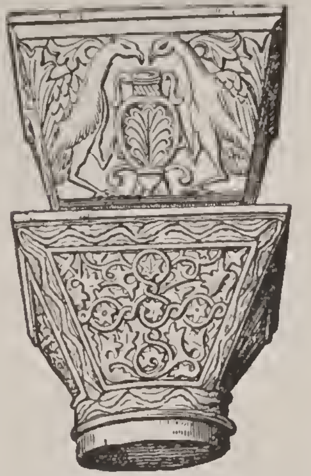


Fig. 12.—Center of triptych, by Perugino, painted for the Certosa near Pavia. (National Gallery.)



Sixth-century capital from S. Vitale at Ravenna.

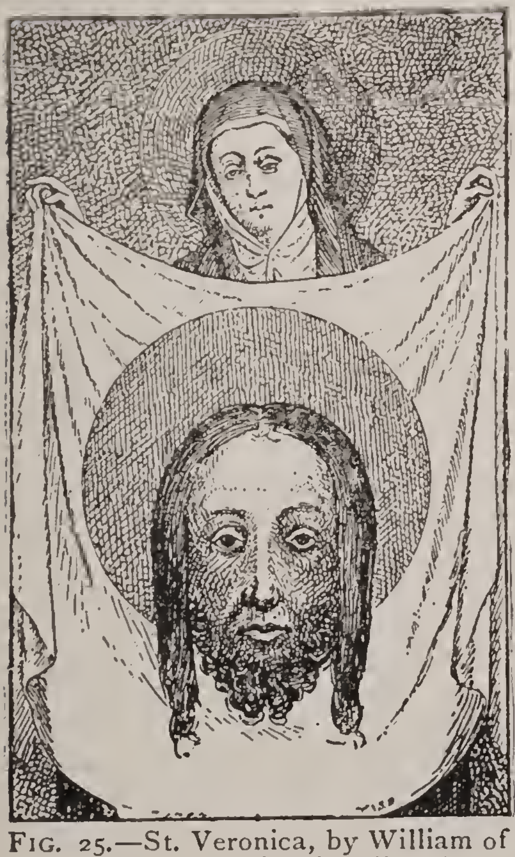
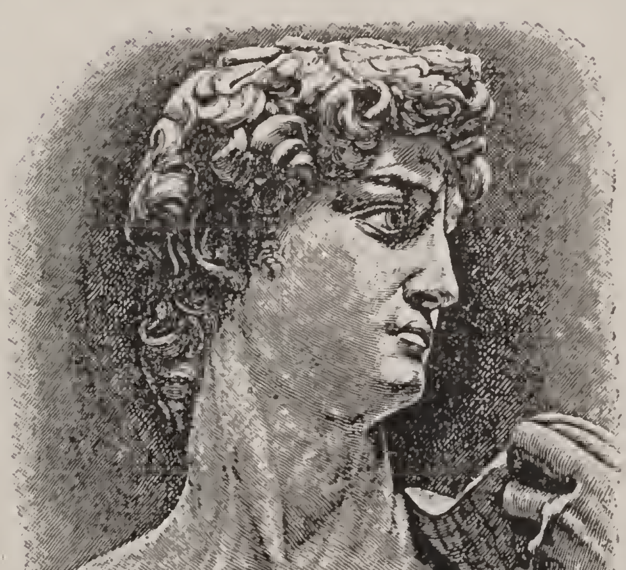
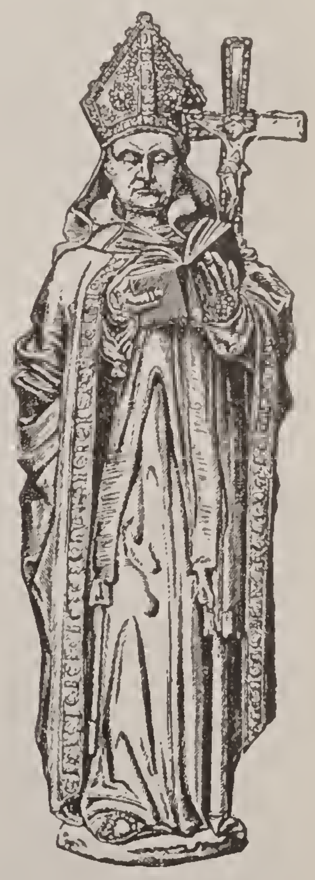


Fig. 25.—St. Veronica, by William of Cologne. (National Gallery.)



Head of the colossal statue of David, by Michelangelo at Florence.



Statue (life-size) of St. Thomas of Canterbury.

PAINTING AND SCULPTURE.

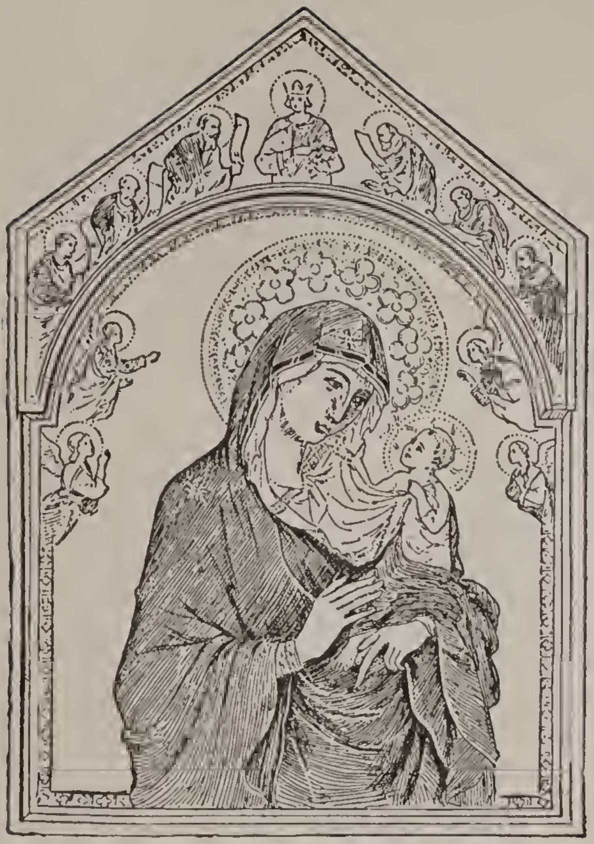


Fig. 1.—Center of a triptych, by Duccio di Buoninsegna,—the Madonna with Angels, and, above, David and six Prophets. (National Gallery, London.)

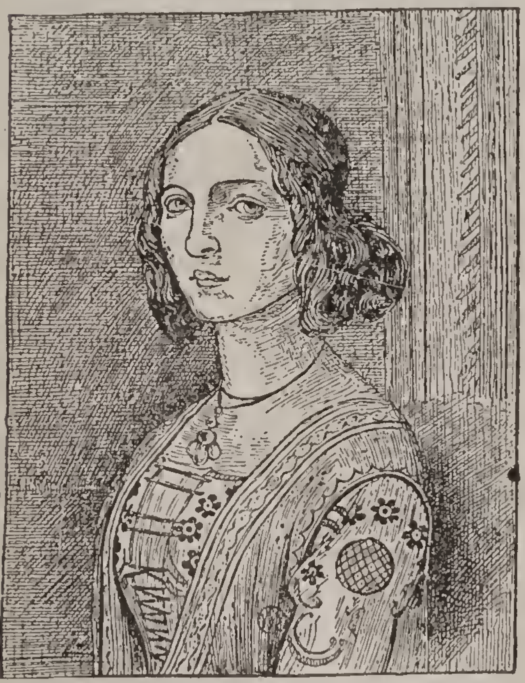


Fig. 7.—Portrait head, by Ghirlandaio, from one of his frescoes in the retrochoir of S. Maria Novella, at Florence.

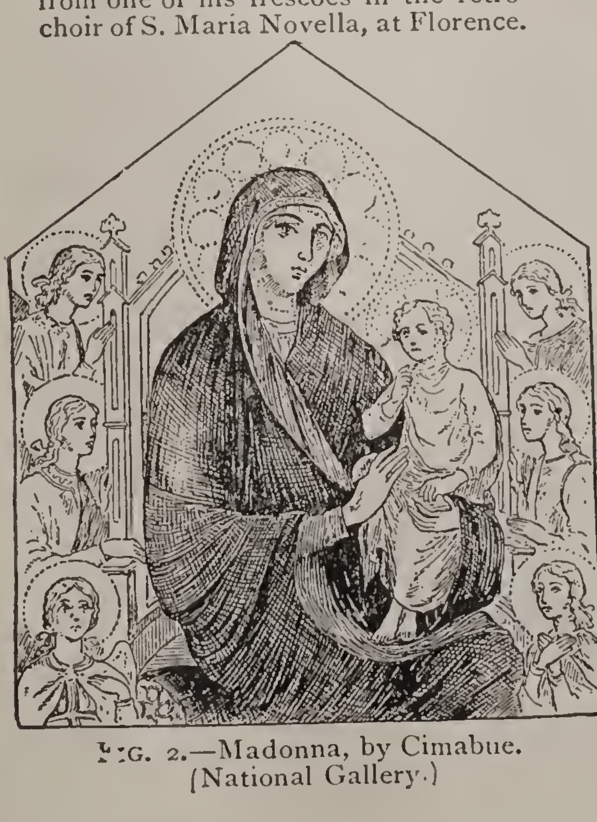


Fig. 2.—Madonna, by Cimabue. (National Gallery.)

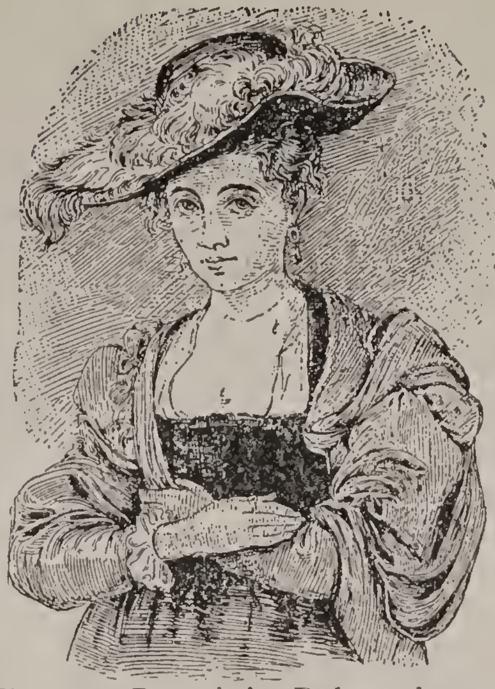


Fig. 31.—Portrait by Rubens, known as the "Chapeau de Poil." (National Gallery.)

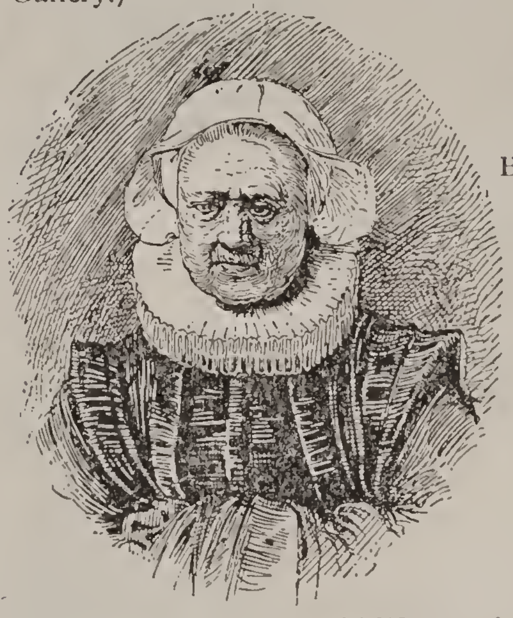
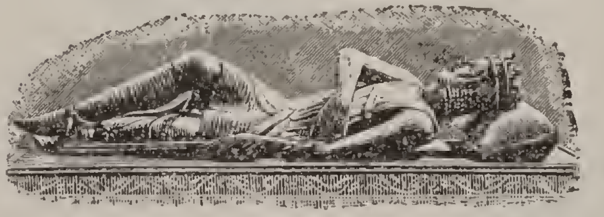
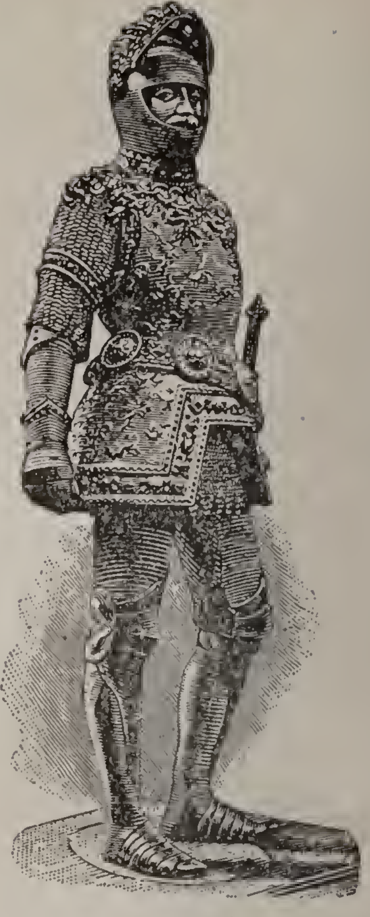


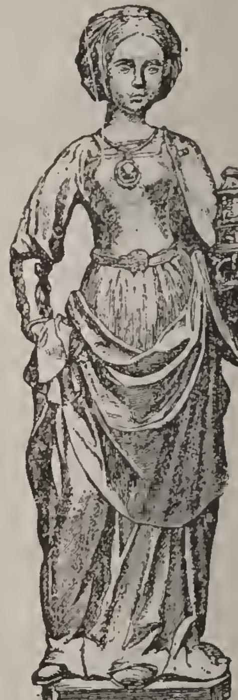
Fig. 33.—Portrait of an Old Woman, by Rembrandt. (National Gallery.)



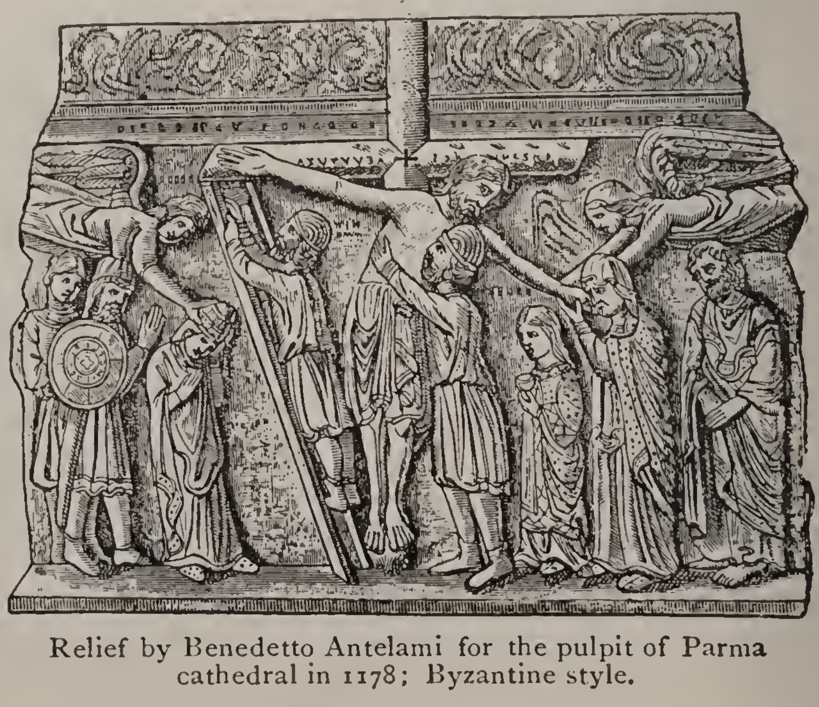
Effigy in oak of Robert, duke of Normandy, in Gloucester cathedral; once painted and gilt.



Bronze statue of King Arthur, Innsbruck.



Statuette of St. Mary Magdalene, late 15th century.



Relief by Benedetto Antelami for the pulpit of Parma cathedral in 1178; Byzantine style.

whom the chief were perhaps Sano di Pietro and Matteo di Giovanni, whose grand altarpiece (No. 1155), recently acquired, is one of the glories of the English National Gallery. Many excellent masters were working at Siena throughout the fifteenth century and even later; the last names of any real note are those of Peruzzi and Beccafumi. Sodoma, though he settled in Siena in 1501, does not belong to the school of Siena; his early life was passed at Milan, chiefly under the influence of Da Vinci. His talent was developed at Rome among the followers of Raphael.

On the whole the Florentine school surpasses in importance all others throughout Italy. Cimabue, though he did not emancipate himself from the Byzantine manner, was a painter of real genius (see fig. 2). Giotto is perhaps the most important painter in the history of the development of art, for during the whole of the fourteenth century the painters of Florence may be said to have been his pupils and imitators (see fig. 3). Orcagna alone developed rather a different line, more richly decorative in style and brighter in color—a link between the art of Giotto and that of Siena. In the fifteenth century Florence reached its period of highest artistic splendor and developed an almost naturalistic school, which appears to have been inaugurated by Masolino and Masaccio. Some few painters, such as Fra Angelico and his pupil Benozzo Gozzoli, produced more purely sacred and decorative work, following the lead of Orcagna. As Baron Rumohr has pointed out, the main bulk of the Florentine fifteenth-century painters may be divided into three groups with different characteristics. The first, including Masolino, Masaccio, Lippo Lippi, Botticelli, Filippino Lippi, and their pupils, aimed especially at strong action, dramatic force, and passionate expression (see figs. 5 and 6). The second, including Baldovinetti, Rosselli, Ghirlandaio, and his pupils, are remarkable for realistic truth and vigorous individuality (see fig. 7). To the third belong Ghiberti, who began life as a painter, Pollainolo, Verrocchio, and his pupils Leonardo da Vinci and Lorenzo di Credi—a group largely influenced by the practice of the arts of the goldsmith and the sculptor. Signorelli, whose chief works are at Orvieto and Monte Oliveto near Siena, was remarkable for his knowledge and masterly treatment of the nude (see fig. 8). Andrea del Sarto was one of the last artists of the golden age of painting in Florence; the soft beauty of his work is, however, often marred by a monotonous mannerism. To him are wrongly attributed many paintings by Puligo and other scholars, who imitated his style with various degrees of closeness. The sixteenth century in Florence was a period of the most rapid decline and was for long chiefly remarkable for its feeble caricatures of Michelangelo's inimitable style.

Between the end of the fourteenth and the beginning of the sixteenth century the Umbrian school produced many painters of great importance grouped around a number of different centers, such as Gubbio, where Ottaviano Nelli lived; San Severino, with its two Lorenzos; Fabriano, famed for its able masters Allegretto Nuzi and Gentile da Fabriano; Foligno, whence Niccolo took his name; and above all Borgo San Sepolcro, where Piero della Francesca was born. Piero was one of the most charming of all painters for his delicate modeling, tender color, and beauty of expression. His masterpiece, a large altar-painting of the Madonna enthroned, with standing saints at the side, and in front a kneeling portrait of Duke Federigo da Montefeltro, in the Brera gallery, is, strange to say, attributed to his pupil Fra Carnovale. Gentile da Fabriano worked in the purely religious and richly decorative style that characterized Fra Angerico at Perugia. Fiorenzo di Lorenzo (see fig. 11) and Bonfigli prepared the way for Perugino (see fig. 12) and his pupils Pinturicchio, Raphael, Lo Spagna, and others. Timoteo Viti was another Umbrian painter of great ability, whose portrait by Raphael in black and red chalk is one of the most beautiful of the drawings in the Print Room of the British Museum.

The Paduan school is chiefly remarkable for the great name of Andrea Mantegna, the pupil of Squarcione; his firm and sculpturesque drawing is combined with great beauty of color and vigorous expression (see fig. 13). His pupil Montegna also studied under Gian. Bellini at Venice. Andrea Mantegna influenced and was influenced by the Venetian school; to him are attributed many of the early paintings of his brother-in-law Gian. Bellini, such as the *Vatican Pietà*, and other works more remakable for vigor than grace.

The school of Arezzo was early in its development. Margaritone, who is absurdly overpraised by his fellow-townsman Vasari, was an artist of the most feeble abilities. In the fourteenth century Arezzo produced such able painters as Spinello di Luca, Niccolo di Gerini, and Lorenzo di Bicci. In the fifteenth century it possessed no native school worth recording.

Venice did not come into prominence until the fifteenth century; the Vivarini family of Murano were at work about the middle of it, and were perhaps influenced by the German style of a contemporary painter from Cologne, known as Johannes Alemannus, who had settled in Venice. Some years later the technical methods of Flanders were introduced by Antonello of Messina, who is said to have learned the secret of an oil medium from the Van Eycks. Crivelli, an able, though mannered, painter of the second half of the fifteenth century, adhered to an earlier type than his contemporaries. Gian. Bellini is one of the chief glories of the Venetian school; as are also in a secondary degree his brother Gentile and his pupil Vittore Carpaccio. In the following century Venice possessed a school which for glory of color and technical power has never been rivaled, though it soon lost the sweet religious sentiment of the earlier Venetians. The chief names of this epoch are Palma Vecchio, Giorgione, Titian (see fig. 16), and Lorenzo Lotto—the last a magnificent portrait painter, a branch of art in which Venice occupied the highest rank. In the sixteenth century Tintoretto and Paul Veronese were supreme (see fig. 17). In the seventeenth and eighteenth centuries Venice produced some fairly good work.

The Brescian school has bequeathed two very illustrious names—Moretto and his pupil Moroni, both portrait painters of extraordinary power during the sixteenth century (see fig. 18). Moretto also painted some fine, large altar-pieces, remarkable for their delicate silver-gray tones and refined modeling. Romanino was an extremely able painter of frescoes as well as of easel pictures.

The school of Verona, which existed from the thirteenth to the seventeenth century, contains few names of highest importance; except that of Pisanello, the chief were painters of the end of the fifteenth and the early part of the sixteenth century, as Domenico and Francesco Morone, Bonsignori, Girolamo dai Libri, and Cavazzola. Paul Veronese, though at first he painted in his native town, soon attached himself to the Venetian school.

Ferrara possessed a small native school in the fifteenth and sixteenth centuries, Cosimo Tura, Ercole Grandi, Dosso Dossi, and Garofalo being among the chief artists. The paintings of this school are often vigorous in drawing, but rather mannered, and usually somewhat hard in color. After 1470 there was an intimate connection between the schools of Ferrara and Bologna.

The Bologna school existed, though not in a very characteristic form, in the fourteenth century. Francia and Lorenzo Costa of Ferrara were its chief painters at the end of the fifteenth century. It was, however, in the sixteenth and seventeenth centuries that Bologna took a leading place as a school of Italian painting, the beginning of which dates from about 1480, when several able painters from Ferrara settled in Bologna. The three Caracci, Guido, Domenichino, and Guercino were the most admired painters of their time, and continued to be esteemed far beyond their real value till about the middle of the nineteenth century. Since then, however, the strong reaction favor of earlier art has gone to the other extreme, and the real merits of the Bolognese school, such as their powerful drawing and skillful though visibly scholastic composition, are now usually overlooked.

Both Modena and Parma possessed mediocre painters in the fourteenth and fifteenth centuries. In the sixteenth Correggio and his pupil Parmigiano attained to a very high degree of popularity. Correggio, who was largely influenced by the Ferrara-Bologna school, is sometimes weak in drawing and affected in composition, but will always be esteemed for the rich softness of his modeling and the delicate pearly tone of his flesh tints.

The small school of Cremona occupies only a subordinate position. Boccaccino was its ablest painter; his rare works are remarkable for conscientious finish, combined with some provincial mannerism.

In the fifteenth and early part of the sixteenth century Milan had one of the most important schools in Italy. Its first member of any note was Vincenzo Foppa, who was painting in 1457 and was the founder of the early school. Ambrogio Borgognone, born about 1455, was an artist of great merit and strong religious sentiment. He followed in the footsteps of Foppa, and his pictures are remarkable for the calm beauty of the faces, and for their delicate color, which recalls the manner of Piero della Francesca. Leonardo da Vinci, though trained in Florence, may be said to have created the later Milanese school. Fig. 23 shows one of the very few pictures by his hands which still exist. The marvellous and almost universal genius of Leonardo caused his influence to be powerfully extended, not only among his immediate pupils, but also among almost all the Lombard painters of his own and the succeeding generation. His closest followers were Salaino, Luini, Cesare da Sesto, Beltraffio, and Marco d'Oggiono, and in a lesser degree Andrea Solario, Gaudenzio Ferrari, and Sodoma, who introduced a new style of painting into Siena. Solario also studied in Flanders, and in Venice under Gian. Bellini, so that a curiously composite style is visible in some of his magnificent portraits. Most of the pictures and many drawings usually attributed to Da Vinci are really the work of his pupils and imitators. Luini, in his magnificent frescoes, was one of the last painters who preserved the religious dignity and simplicity of the older mediæval schools. Fresco painting was practiced by the Milanese after it had been generally abandoned elsewhere.

Rome has always been remarkable for its absence of native talent in any of the fine arts, and nearly all the members of the so-called Roman school came from other cities. This school at first consisted of the personal pupils of Raphael—Fran. Penni, Da Imola, Giulio Romano, and Del Vaga. Sassoferrato and Carlo Maratta were feeble but very popular painters in the seventeenth century.

The early history of the Neapolitan school is mostly mythical; it had no individual existence till the sixteenth century, and then chiefly in the person of Caravaggio. During the fifteenth century many works of the Van Eycks and other Flemish painters were imported into Naples; some of these were afterward claimed by the vanity of native writers, as paintings by early Neapolitan artists, for whom imaginary names and histories were invented. The Spaniard Ribera, Salvator Rosa, and Giordano were its chief members in the seventeenth century.

2. *German.*

It was especially at Cologne in Westphalia and in the Rhine provinces generally that German painting was developed at an early time. William of Cologne, who died about 1378, painted panels with much delicacy and richness of color (see fig 25). A number of large and highly finished altarpieces were painted in this part of Germany during the fifteenth century, but the names of very few of the painters of that time are known. Artists such as Schongauer, Von Meckenen, Cramach, and others were more at home in the engraving of copper and wood than in painting, and to some extent the same might be said of Albert Dürer, an artist of the highest and most varied talents, who especially excelled as a portrait painter (see fig. 26). The Hans Holbeins, father and son, especially the latter, attained the highest rank as portrait painters; nothing can exceed the vivid truthfulness and exquisite workmanship of the portraits by the younger Holbein (see fig. 27), who also painted very beautiful religious pictures. Since his time Germany has produced few noteworthy painters. In the nineteenth century Overbeck was remarkable for an attempt to revive the long dead religious spirit in painting, and he attained much popularity, which, however, has now almost wholly died away.

3. *Flemish.*

Hubert and Jan van Eyck, who were painting at the beginning of the fifteenth century, were artists of the very highest rank; with their unrivaled technical skill, their exquisite finish, and the splendor of their color, they produced works which in some respects even surpassed those of any of the Italian painters. Probably no other artists ever lavished time and patient labor quite to the same extent to which Jan van Eyck did upon some of his works, such as the *Arnolfini* and other portraits in the National Gallery and the *Madonna* with the kneeling *Donor* in the Louvre. This last is one of the loveliest pictures in the world, both as a figure painting and from its exquisite miniature landscape and town in the distance, all glowing with the warm light of the setting sun. The elder Van der Weyden was a most able pupil of the Van Eycks; he occasionally practiced a very different technical method from that usually employed in Flanders—that is to say, he painted in pure tempera colors on unprimed linen, the flesh tints especially being laid on extremely thin, so that the texture of the linen remains unhidden. Other colors, such as a smalto blue used for draperies, are applied in greater body, and the whole is left uncovered by any varnish. A very perfect example of this exists in the National Gallery. The special method used with such success by the Van Eycks and their school was to paint the whole picture carefully in tempera, and then to glaze it over in transparent oil colors; the use of oil as a medium was common in the thirteenth century and even earlier (see MURAL DECORATION). To the school of the Van Eycks belong a number of other very talented painters, who inherited much of their marvelous delicacy of finish and richness of color; the chief of these were Memling, Van der Meire, and the younger Van der Weyden, to whom is attributed No. 654 in the National Gallery. The color of this lovely picture is magnificent beyond all

PAINTINGS.

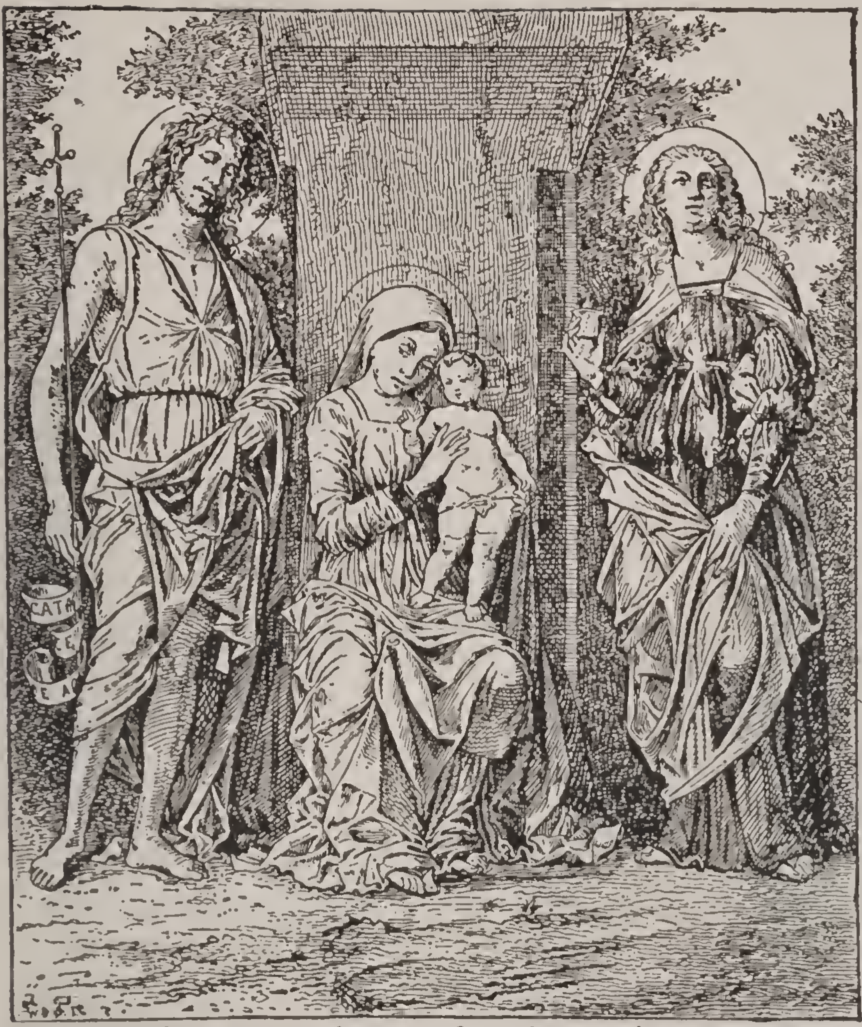


FIG. 13.—The Madonna between St. John Baptist and St. Mary Magdalene, by Andrea Mantegna, on canvas. (National Gallery.)

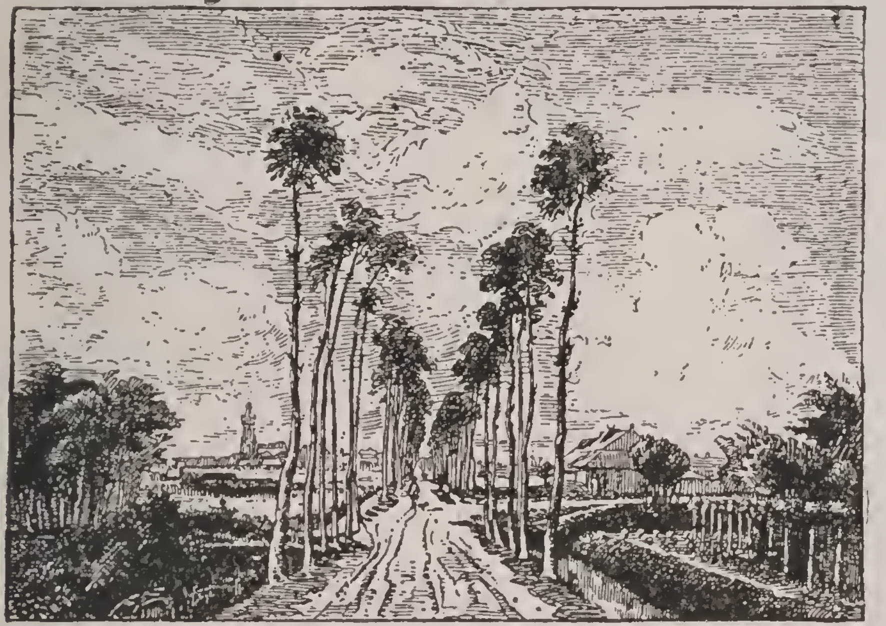


FIG. 35.—View of Middelharnis, in Holland, by Hobbema. (National Gallery.)

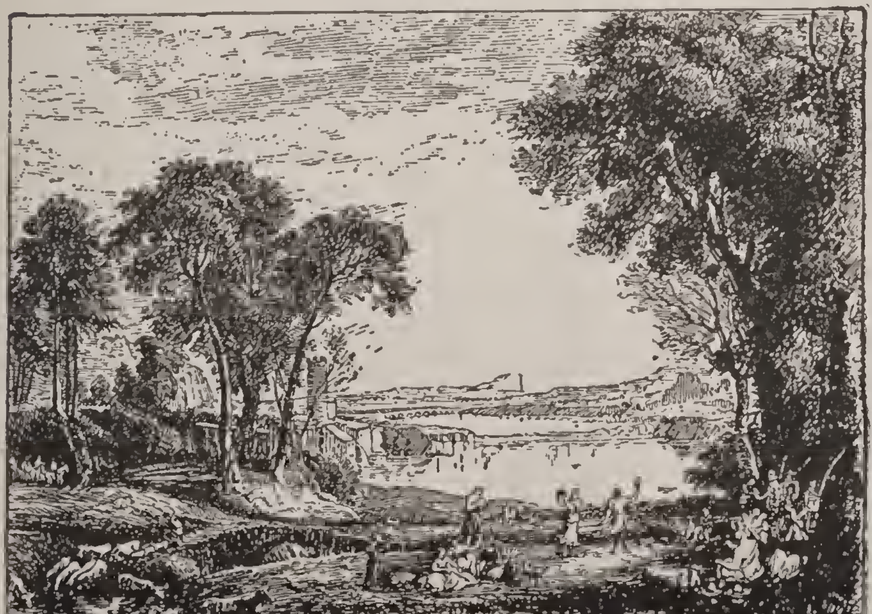


FIG. 39.—Landscape, by Claude Lorrain. (National Gallery.)

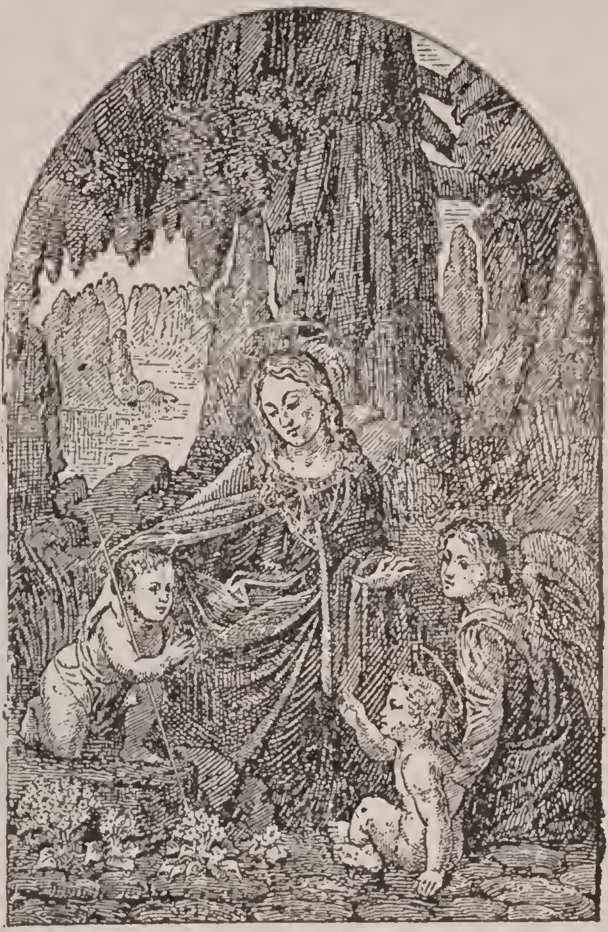


FIG. 23.—The Madonna with the Rocks, by Leonardo da Vinci. (National Gallery.)

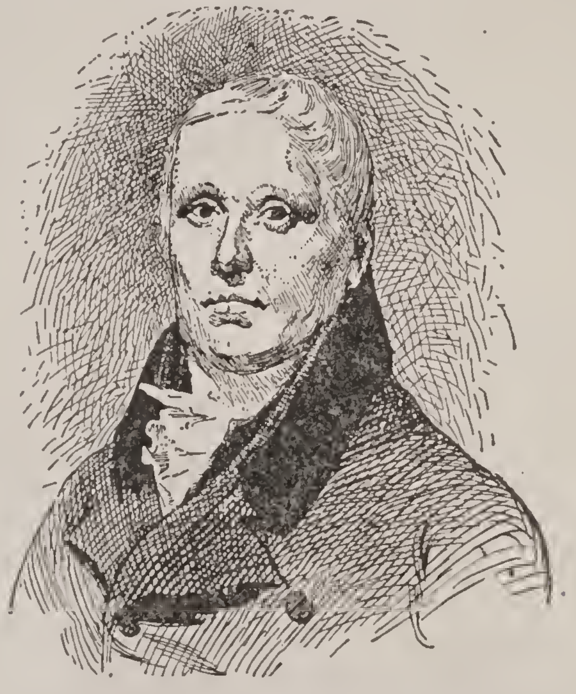


FIG. 42.—Portrait of Rev. Arch. Alison, by Sir H. Raeburn. (National Portrait Gallery.)

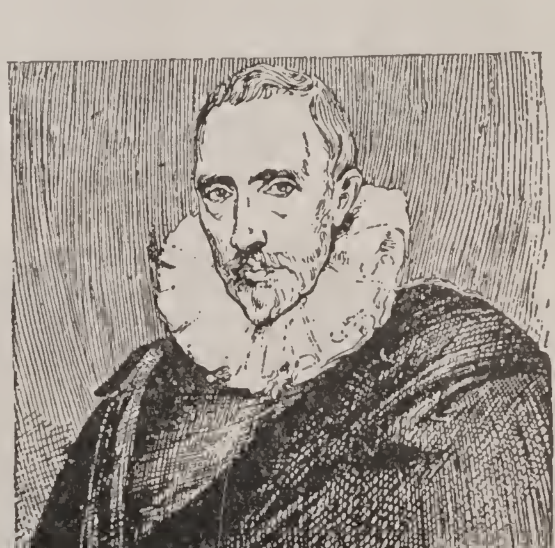


FIG. 32.—Portrait of Cornelius Van der Geest, by Vandyck or Rubens. (National Gallery.)

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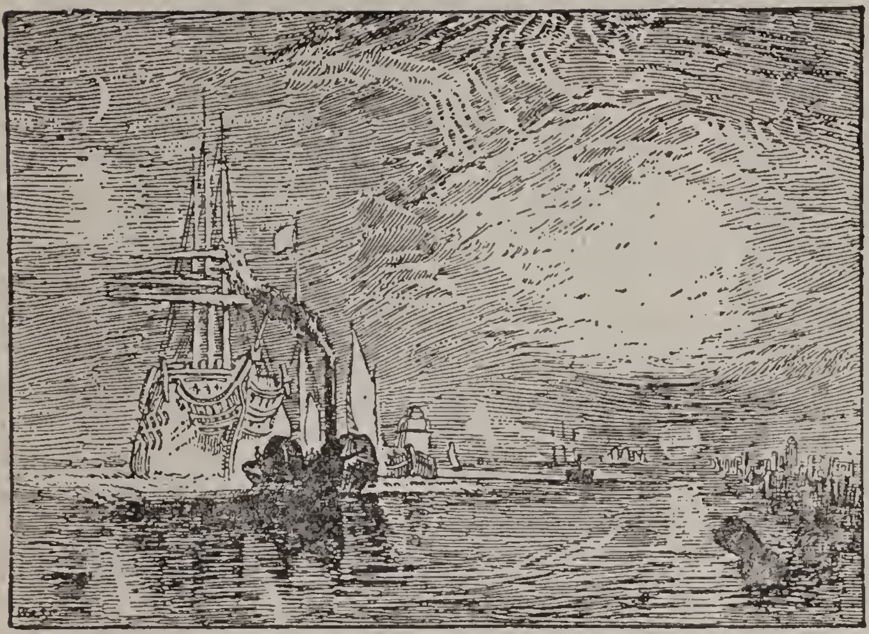


Fig. 43.—The Temeraire towed to her last Moorings. Turner.

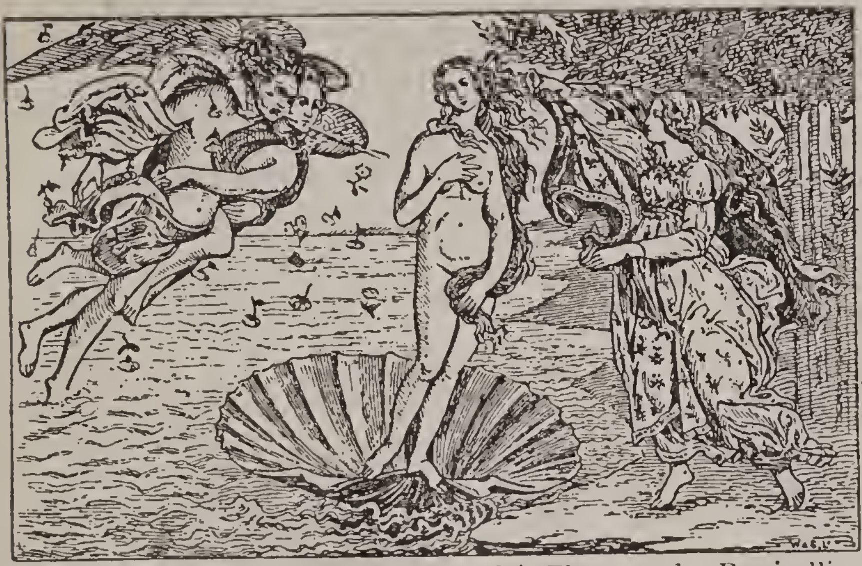


Fig. 5.—Picture on canvas in the Uffizi, Florence, by Botticelli—the Birth of Venus.

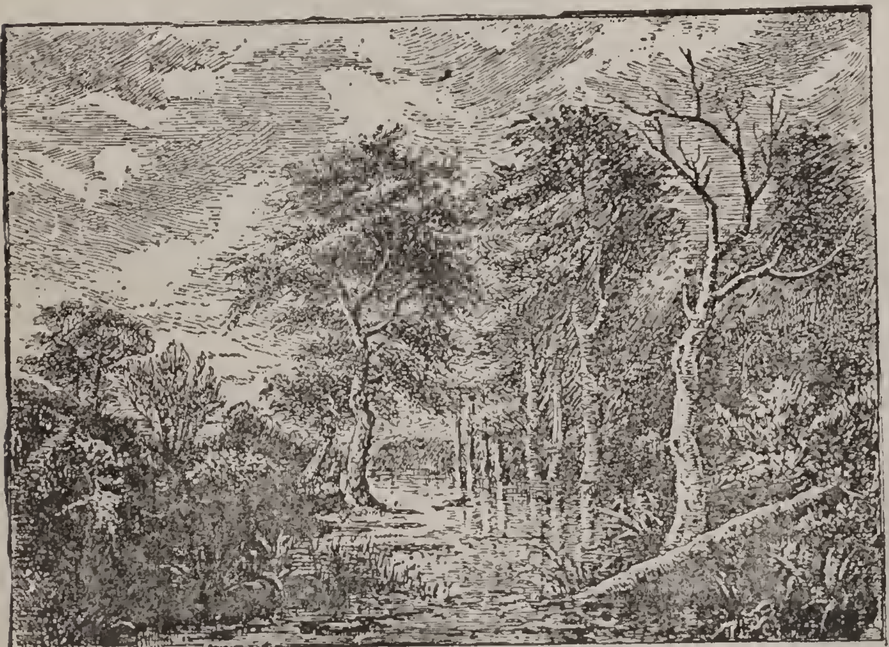


Fig. 34.—Landscape, by Ruysdael. (National Gallery.)

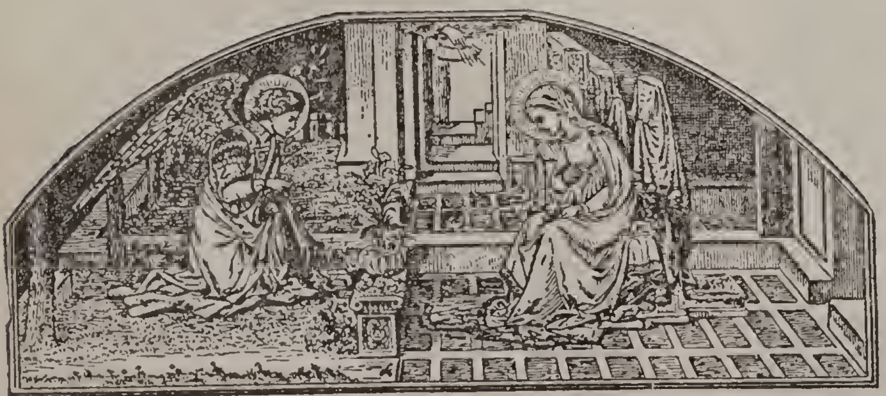


Fig. 6.—The Annunciation, by Lippo Lippi. (National Gallery.)

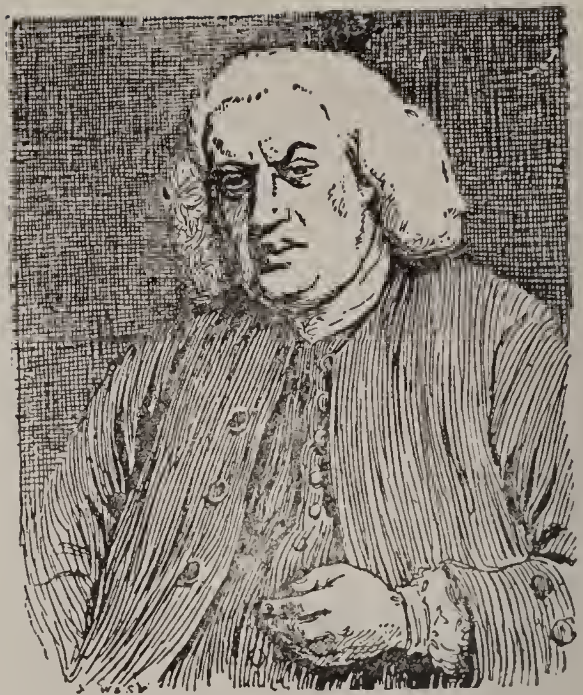


Fig. 40.—Portrait of Dr. Johnson, by Reynolds. (National Gallery. A replica of this exists in Pembroke College, Oxford.)

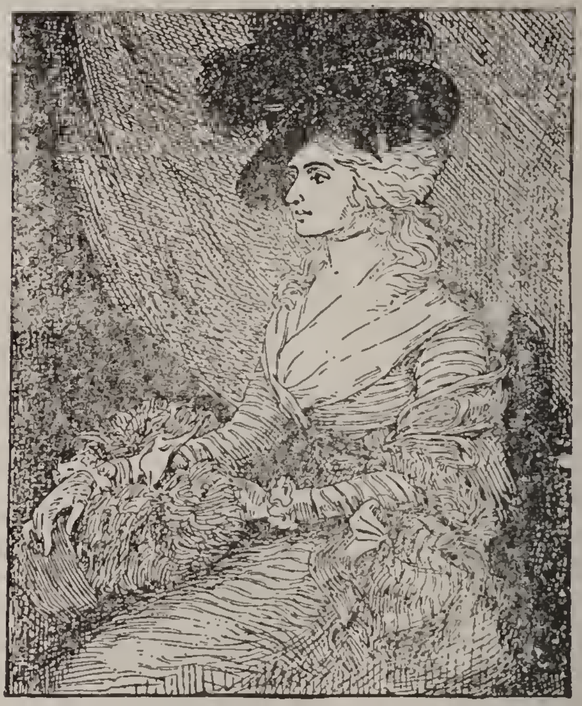


Fig. 41.—Portrait of Mrs. Siddons, by Gainsborough. (National Gallery.)

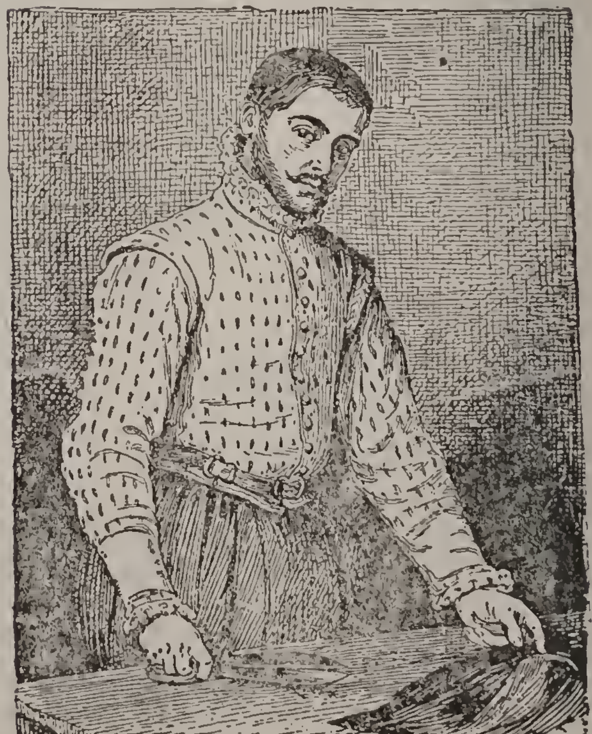


Fig. 18.—Portrait of a Tailor, by Moroni. (National Gallery.)

description. Quintin Matsys (Massys) and Gheerardt David also produced works of great beauty and extraordinary finished execution.

At the beginning of the sixteenth century Flemish art began to lose rapidly in vigor, a weaker style being substituted under the influence of Italy. To this period belong Mabuse, Van Orley, and Patinir, who appeared to have been special admirers of Raphael's latest manner. In the latter half of the century Antonij Mor, usually known as Antonio Moro, was a portrait painter of the very highest rank. A portrait of Queen Mary of England at Madrid, and one of a youth of the Farnese family at Parma, are real masterpieces of portraiture. He spent some time in England. The Breughel family in the sixteenth and seventeenth centuries produced feeble works finished with microscopic detail. Rubens and his pupil Vandyck in the seventeenth century were among the greatest portrait painters the world has ever seen (see figs. 31 and 32), and had many able followers on the Continent and in England.

4. *Dutch.*

This school was chiefly remarkable for its painters of *genre* subjects, often treated with a very ignoble realism, especially by the various members of the Teniers family. Rembrandt, the greatest painter of the school, developed a quite original style, remarkable for the force shown in his effective treatment of light and shade. The vigorous life and technical skill shown in some of his portraits have never been surpassed (see fig. 33). As a rule, however, he cared but little for color, and used the etching needle with special enjoyment and dexterity. Terburg, Gerhard Dou (Douw), and Wouwerman had more sense of beauty, and worked with the most miniature-like delicacy. Another school excelled in landscape, especially Ruysdael and Hobbema (see figs. 34 and 35). Vandevelde was remarkable for his sea-pieces, and Paul Potter for quiet pastoral scenes with exquisitely painted cattle. Throughout the seventeenth century the painters of the Dutch school far outnumbered those of any other, and many of them reached a very fair average of skill.

5. *Spanish.*

The early Spanish painters of the fifteenth and sixteenth centuries were merely feeble imitators of the Italian art. Many of them, such as Juan de Juanes, studied in Italy. Ribalta and Zurbaran were perhaps the first able artists who developed a national style. The latter is remarkable for his paintings of monks; fig. 36 shows one of the best examples. His large altarpieces are less successful. Valazquez, one of the greatest masters of skillful execution the world has seen, was alike great in portraiture (see fig. 37) and in large figure subjects. His early religious paintings, executed under the influence of Ribalta, are far inferior to his later works, the best of which are at Madrid. Murillo is usually rather undervalued; he was very unequal in his work, and is well represented nowhere except at Seville. No words can describe the exquisite religious beauty and pathos of his great picture of Christ on the Cross bending down to embrace St. Francis. Goya, who lived into the nineteenth century, was an artist of great power, haunted by a hideous imagination. Fortuny, a very clever young painter, who died in Rome in 1874, was remarkable for his daring use of the most brilliant color, with which his pictures are studded like a mosaic. His success has caused him to have countless imitators, most of whom reproduced the faults rather than the merits of his work. His influence on modern Continental art has been very great.

6. *French.*

French art, like that of Spain, was almost wholly under Italian influence during the fifteenth and sixteenth centuries. Nicolas Poussin, in the seventeenth century, was the first to develop a native style, though he was much influenced by Titian. His best works are bacchanalian scenes, of which one of the finest is in the National Gallery (see fig. 38). When at his best his flesh painting resembles that of Titian, but it is frequently marred by unpleasant hot coloring. Claude Lorrain is remarkable for his beautiful and imaginative landscapes —often wanting in a real study of nature (see fig. 39). His finest works are in England. Throughout the eighteenth century the French school was very prolific, but shared the mediocrity of the age, the corruption and artificiality of which impress themselves strongly on the painting of the time. The most popular of that century were Watteau, Boucher, Greuze, Claude Vernet, Fragonard, and David, the reviver of the pseudo-classic style. In the first half of the nineteenth century Prud'hon, Ingres, Horace Vernet, and Delaroche—artists of only moderate merit—were in great repute, and more deservedly the very brilliant landscape painter Rousseau. Millet, though little valued during his lifetime, is now highly appreciated. Regnault, a very able painter, who while yet young was killed at the siege of Paris in 1871, belongs to the latest development of French art. At present Paris possesses by far the most important school of art existing, and French painters on the whole are supreme in power of drawing and in technical skill. Unhappily these great merits are often counterbalanced by false sentimentalism or excessive realism, and especially by gross sensuality. Art in France—that is, in Paris—is now in a state of the most prolific activity, and is branching out into new and startling phases, such as the impressionist style, in which *form* is suppressed for the sake of *color*, and the naturalist school, which leans rather to what is ugly or even loathsome; to the latter belong some of the technically ablest painters alive. As in Spain and Italy, the influence of Fortuny is strong in Paris, and Parisian influence now extends very widely, as the École des Beaux-Arts is resorted to by art students from all countries except Germany.

7. *British.*

The modern British school begins with the painters of miniature portraits in the sixteenth and seventeenth centuries, among whom the earliest were Nicholas Hilliard and Isaac Oliver, artists of some note in the reign of Elizabeth. Many very beautiful miniatures were produced by them and by the younger Peter Oliver, who rose into celebrity under the Commonwealth. Other able portrait painters of the seventeenth century were the Scotch Jamesone, a pupil of Rubens, William Dobson, a pupil of Vandyck, and Samuel Cooper; but the chief court painters after the Restoration were the Flemish Sir Peter Lely and Sir Godfrey Kneller, whose influence on art in England was disastrous. The eighteenth century produced many painters of the highest merit, as Hogarth, who stands unrivalled as a caricaturist and moralist, Reynolds and his rival Gainsborough, notable among the chief portrait painters of the world (see figs. 41, 42, 43). Scotland produced two of the chief painters of this time—Sir William Allan and Sir David Wilkie. Mulready was a fine draughtsman, skillful in composition, but weak in color. Etty's scholastic drawing recalls the merits and faults of the Bolognese school, and he is frequently very fine in color. Eastlake was weak in drawing and feeble in composition. Sir Edwin Landseer excelled in animal painting, especially in his rendering of the texture of hair and fur, but was frequently rather harsh in color and commonplace in motive. David Roberts is worthy of note for his very clever water-colors of architectural scenes, J. F. Lewis for his exquisitely finished Oriental subjects, and J. S. Raven for his grand and imaginative landscapes, which, however, are very little known. Dante Gabriel Rossetti, who died in 1882, was one of the chief painters of the century, both for the richness of the coloring and for his strong poetical imagination; he was one of the founders of the Pre-Raphaelite "brotherhood" (see ROSSETTI), whose rise, development, and widespread influence on painting in Britain have been the chief artistic events in this century, and have produced a few painters whose earnestness of purpose and originality of power give them a foremost and absolutely unique position in modern Europe.

SCHOPENHAUER, ARTHUR, was born in Dantzic (117 Heiligen-Geist Strasse) on February 22, 1788. Doomed for the first thirty years of his career to find his works ignored with galling silence, he came, from the year 1845 onward, to be looked up to by a scanty but devoted following as, what he himself claimed to be, the founder of the first true philosophy. Historical criticism has done much to dispel his pretensions to originality, and logical examination has demonstrated the incongruities lurking in his system. But the fact of his dominant influence on contemporary thought remains undiminished after every such disparaging analysis. He consoled himself for the neglect of his own generation by the assurance that his would be the philosophy of the future. His ideas, recommended by the mastery of language and brilliance of illustration, which entitle him to a first class in literature, have become the burden of much of our current speculation, and have leavened to an unusual extent the view of life and of the universe which animates the average educated world and finds expression in literary art.

In 1809 his mother handed over to him (aged twenty-one) the third part of the paternal estate, a sum of 19,000 thalers, which, being invested in good securities, yielded him from the first a yearly income of more than 1,000 thalers=$750. Possessed of this fair patrimony, Schopenhauer, in October, 1809, entered the university of Göttingen, with a clear plan of acquiring all that machinery of knowlege which schools can give. The direction of his philosophical reading was fixed by the advice of Prof. G. E. Schulze to study, especially, Plato and Kant. For the former he soon found himself full of reverence, and from the latter he acquired the standpoint of modern philosophy.

After two years at Göttingen he took two years at Berlin, where the university had been founded only four years before. Here also he dipped into divers stores of learning, notably classics under Wolf. In philosophy he heard Fichte and Schleiermacher. On October 2, 1813, he received his diploma from Jena; and in the same year, from the press at Rudolstadt, there was published—without winning notice or readers—his first book, under the title *Ueber die vierfache Wurzel des Satzes vom zureichenden Grunde,* 148 pages, 8vo.

In 1808 Friedrich Schlegel had in his *Language and Wisdom of the Old Hindus* brought Brahmanical philosophy within the range of European literature. Still more instructive for Schopenhauer was the imperfect and obscure Latin translation of the *Upanishads* which in 1801–2 Anquetil Duperron had published from a Persian version of the Sanskrit original. Another friendship of the same period had more palpable immediate effect, but not so permanent. This was with Goethe, who succeeded in securing his interest for those investigations on colors on which he was himself engaged. Schopenhauer took up the subject in earnest, and the result of his reflections (and a few elementary observations) soon after appeared (Easter, 1816) as a monograph, *Ueber das Sehen und die Farben.*

At the end of 1818 another of his works, his most famous, appeared (with the date 1819), in 725 pages, 8vo, with the title *Die Welt als Wille und Vorstellung,* in four books, with an appendix containing a criticism of the Kantian philosophy.

After traveling in Italy and spending some time in Dresden, during which time he wrote nothing of account, he returned to Berlin. The six years (1825–31) at Berlin were a dismal period in the life of Schopenhauer. In vain did he watch for any sign of recognition of his philosophic genius. Hegelianism reigned in the schools and in literature and basked in the sunshine of authority. It was a bad time for an independent thinker who ignored the state and the yearlong alliance between philosophy and theology. Thus driven back upon himself, Schopenhauer fell into morbid meditations, and the world which he saw, if it was stripped naked of its disguises, lost its proportions in the distorting light. But he wrote nothing material. In 1828 he made inquiries about a chair at Heidelberg; and in 1830 he got a shortened Latin version of his physiological theory of colors inserted in the third volume of the *Scriptores Ophthalmologici Minores* (edited by Radius).

Another pathway to reputation was suggested by some remarks he saw in the seventh number of the *Foreign Review,* in an article on Damiron's *French Philosophy in the Nineteenth Century.* With reference to some statements in the article on the importance of Kant, he sent in very fair English a letter to the writer, offering to translate Kant's principal works into English. He named his wages and inclosed a specimen of his work. His correspondent, Francis Haywood, made a counter-proposal which so disgusted Schopenhauer that he addressed his next letter to the publishers of the review. When they again referred him to Haywood, he applied to Thomas Campbell, then chairman of a company formed for buying up the copyright of meritorious but rejected works. Nothing came of this application. A translation of selections from the works of Balthazar Gracian, which was published by Frauenstädt in 1862, seems to have been made about this time.

In the summer of 1831 cholera raged at Berlin, and Schopenhauer fled to Frankfort. About a year later he adjourned to Mannheim. But after eleven months experience of the latter he decided, from a carefully weighed list of comparative advantages, in favor of Frankfort. And there, accordingly, for the rest of his life he remained.

Ever since the publication of *The World as Will and Idea* he had silently waited for some response to his message. He had uttered the word he felt himself charged to utter. As the years passed he noted down every confirmation he found of his own opinions in the writings of others, and every instance in which his views appeared to be illustrated by new researches. Full of the conviction of his idea, he saw everything in the light of it, and gave each *aperçu* a place in his alphabetically arranged note-book. Everything he published in later life may be called a commentary, an excursus, or a scholium to his main book; and many of them are decidedly of the nature of commonplace books or collectanea of notes. But along with the accumulation of his illustrative and corroborative materials grew the bitterness of heart which found its utterances neglected and other names the oracles of the reading world. The gathered ill-humor of many years, aggravated by the confident assurance of the Hegelians, found vent at length in the introduction to his text-book, where Hegel's works are described as three-quarters utter absurdity and one quarter mere paradox—a specimen of the language in which during his subsequent career he used to advert to his three predecessors Fichte, Schelling, but above all Hegel. This work, with its wild outcry against the philosophy of the professoriate, was entitled *Ueber den Willen in der Natur*, and was published in 1836.

In 1841 he published under the title *Die beiden Grundprobleme der Ethik* two essays which he had sent in 1838–39 in competition for prizes offered. The first was in answer to the question "Whether man's free will can be proved from self-consciousness," proposed by the Norwegian Academy of Sciences at Drontheim. His essay was awarded the prize, and the author elected a member of the society. From 1843 onward a jurist named F. Dorguth had trumpeted abroad Schopenhauer's name. In 1844 a letter from a Darmstadt lawyer, Joh. August Becker, asking for explanation of some difficulties, began an intimate correspondence which went on for some time (and which was published by Becker's son in 1883). But the chief evangelist (so Schopenhauer styled his literary followers as distinct from the apostles who published not) was Frauenstädt, who made his personal acquaintance in 1846. It was Frauenstädt who succeeded in finding a publisher for the *Parerga und Paralipomena*, which appeared at Berlin in 1851 (2 vols., pp. 465, 531). Yet for this bulky collection of essays, philosophical and others, Schopenhauer received as honorarium only ten free copies of the work. Soon afterward, Dr. E. O. Linder, assistant editor of the *Vossis Zeitung*, began a series of Schopenhauerite articles. Among them may be reckoned a translation by Mrs. Linder of an article by John Oxenford which appeared in the *Westminster Review* for April, 1853, entitled *Iconoclasm in German Philosophy*, being an outline of Schopenhauer's system. In 1854 Frauenstädt's *Letters on the Schopenhauerean Philosophy* showed that the new doctrines were become a subject of discussion—a state of things made still more obvious by the university of Leipsic offering a prize for the best exposition and examination of the principles of Schopenhauer's system. Besides this, the response his ideas gave to popular needs and feelings was evinced by numerous correspondents who sought his advice in their difficulties. And for the same reason new editions of his works were called for—a second edition of his degree dissertation in 1847, of his *Essay on Colors* and of *The Will in Nature* in 1854, a third edition of *The World as Will and Idea* in 1859, and in 1860 a second edition of *The Main Problems of Ethics*.

In these later years Schopenhauer had at length realized that peace which can be given in the world; he had become comparatively master of himself. His passions had slackened their strain, and he was no longer the victim of unavailing regrets. As a youth he had known none of those ties which give the individual an *esprit de corps*, a sense of community which he never quite loses. Wandering about from place to place throughout Europe, with no permanent home sweetened by the different phases of family affection, with no reminiscences of comradeship in schoolboy days, with no sentiment of the dues of nationality, Schopenhauer is the fitter interpreter of that modern cosmopolitanism which disdains the more special ties of common life and mutual obligation as being obstacles to free development.

With his low estimate of the average human being, his sympathies were aristocratic. He left the bulk of his fortune to an institution at Berlin for the benefit of those who had suffered on the side of order during the revolutionary struggles of 1848–49. But in so doing it was not his sympathy with kings but his recognition of the merits of public security which gave the motive to his actions. With all his eulogy of voluntary poverty, he did not agree to being deprived of his property by the malice or cupidity of others, and fears of the loss of his means haunted him not less keenly than other imaginary terrors—the fancied evils distracting him no less perhaps than would have done those domestic and civil obligations from which he endeavored to hold himself free. The Nemesis of his social *lâcheté* fell upon his head; and, like all solitaries, he gave an exaggerated importance to trifles, which the sweep of business and customary duty clear away from the ordinary man's memory. In April, 1860, he began to be affected by occasional difficulty in breathing and by palpitation of the heart. Another attack came on in autumn (September 9th), and again a week later. On the evening of the 18th his friend and subsequent biographer, Doctor Gwinner, sat with him and conversed. On the morning of September 21st he rose and sat down alone to breakfast; shortly afterward his doctor called and found him dead in his chair. By his will, made in 1852, with a codicil dated February, 1859, his property, with the exception of some small bequests, was devised to the above-mentioned institution at Berlin. Gwinner was named executor, and Frauenstädt was intrusted with the care of his manuscripts and other literary remains.

SCHRÖTER, JOHANN HIERONYMUS, amateur astronomer, principally known by his physical observations of the moon and planets, was born in Germany in 1745 and died in 1816.

SCHUBERT, FRANZ PETER, composer of vocal and instrumental music, was born at Vienna, January 31, 1797. For the foundation of his general education he was indebted to his father, a schoolmaster in the Leopoldstadt; but the beauty of his voice attracted so much attention that in 1808 he was received into the choir of the imperial chapel, and during the five years which followed he was taught to sing and to play the violin in the choristers' school called the "Convict." When his voice broke in 1813 Schubert left the "Convict," and to avoid the conscription, taught for three years in his father's school. This, however, in nowise damped his zeal for composition. Even at this early period his invention was inexhaustible and the rapidity of his pen almost incredible. In 1815 he composed two symphonies, five operas, and no less than 137 songs (sixty-seven of which have been published), besides a multitude of other important pieces. He wrote on, year after year, producing music of indescribable beauty in such enormous quantities that but for the dated MSS. we should refuse to believe the accounts transmitted to us by his biographers. He wrote because, when his genius inspired him with an idea, he could not refrain. Yet he scarcely ever looked at his compositions after they were finished, and very rarely heard any of them performed. Very little of his dramatic music was given to the world.

Of Schubert's ten symphonies not one made its mark during his lifetime; yet the stamp of genius is upon these as plainly as upon his songs.

It was not to be wondered at that under his heavy trials Schubert's health failed rapidly. After recovering from more than one serious attack of illness, he was seized with a sudden access of delirium while at supper on October 13, 1828; and on November 19th he died.

SCHULTENS. Three Dutch Orientalists of this name have an honorable place among the scholars of the eighteenth century. The first and most important, ALBERT SCHULTENS was born at Groningen in 1686. From 1732 till his death (at Leyden on January 26, 1750) he was professor of Oriental languages at Leyden.

Albert's son, **John James Schultens**, born 1716, became professor at Herborn in 1742, and afterward succeeded to his father's chair. He died in 1778. He was in turn succeeded by his son, **Henry Albert Schultens**, born 1749, a man of great parts, who, however, left comparatively little behind him, having succumbed in 1793 to excessive work while preparing an edition of Meidani, of which only a part appeared posthumously (1795).

SCHULTZE, Max Johann Siegmund, German microscopic anatomist, was born at Freiburg in Briesgau (Baden) on March 25, 1825. He studied at Griefswald and Berlin, and was appointed extraordinary professor at Halle in 1854, and five years later ordinary professor of anatomy and histology at Bonn. He died at Bonn, January 16, 1874.

SCHUMACHER, Heinrich Christian, astronomer, born at Bramstedt in Holstein, September 3, 1780, was director of the Mannheim observatory from 1813 to 1815, and then became professor of astronomy in Copenhagen. From 1817 he directed the triangulation of Holstein, to which a few years later was added a complete geodetic survey of Denmark; the latter was left incomplete by Schumacher, but was finished after his death, which took place in 1850.

SCHUMANN, Robert, musical critic and composer, was born at Zwickau, Saxony, on June 8, 1810. His first essays in musical criticism appeared in the form of contributions to the *Allgemeine musikalische Zeitung;* but in 1834 he started a journal of his own, entitled *Die Neue Zeitschrift für Musik*, and to this from time to time he contributed critiques of the most profound character, sometimes openly written under his own name, sometimes ostensibly emanating from an imaginary brotherhood called the *Davidsbund.*

Schumann's first great orchestral work was his *Symphony in B*, produced in 1841. Another symphony, in D minor, and an orchestral overture, scherzo, and finale, appeared in the same year; and from this time forward works on an equally grand scale appeared in rapid succession, culminating with his first and only opera, *Genoveva*, which, though completed in 1848, was not produced until 1850. In 1843 Schumann was appointed professor of composition in Mendelssohn's newly founded conservatory of music at Leipsic. Two years after Mendelssohn's death he endeavored to obtain the appointment of director of the Gewandhaus concerts, but was rejected. In 1850 he was invited to Düsseldorf as musical director—a post in which Mendelssohn had greatly distinguished himself many years previously. Schumann retained this until 1853, when his mental powers began to decline rapidly through a disease of the brain from which he had long suffered, and of which he died at Endenich, near Bonn, July 29, 1856.

SCHWABE, Samuel Heinrich, German amateur astronomer, was born on October 25, 1789, at Dessau, where he died on April 11, 1875; he observed the sunspots regularly from 1826 and pointed out (in 1843) the periodicity in the number of these objects.

SCHWALBACH, or Langenschwalbach, a favorite German health resort, in the Prussian province of Hesse-Nassau, is pleasantly situated in the deep valley of the Münzenbach near its junction with the Aar, twelve miles northwest from Wiesbaden, with which it has regular communication by diligence. The permanent population of the town was 2,811 in 1880, and the number of visitors reaches about 5,000 annually.

SCHWANN, Théodor, author of the cell theory in physiology, was born at Neuss, in Rhenish Prussia, on December 7, 1810. He died on January 11, 1882.

SCHWANTHALER, Ludwig Michael, German sculptor, was born in Munich on August 26, 1802. From the Munich gymnasium Schwanthaler passed as a student to the Munich academy; at first he purposed to be a painter, but afterward reverted to the plastic arts. Schwanthaler died at Munich in 1848, and left by will to the Munich academy all his models and studies, which now form the Schwanthaler Museum. The sculptor's style may be designated as romantic-classic or modern-antique, and its conventional ideal stands far removed from the school of naturalism and realism.

SCHWARZ, or Schwartz, Christian Friedrich, Protestant missionary to India, was born on October 8, 1726, at Sonnenburg, in the electorate of Brandenburg, Prussia. He died on February 13, 1798. Schwarz's direct success in making converts exceeded that of any other Protestant missionary in India, in addition to which he succeeded in winning the esteem of Mahommedans and Hindus. The rajah of Tanjore erected a monument, executed by Flaxman, in the mission church, in which he is represented as grasping the hand of the dying missionary and receiving his benediction. A splendid monument to Schwarz by Bacon was placed by the East India Company in St. Mary's church at Madras.

SCHWARZBURG-RUDOLSTADT, a small Thuringian principality and an independent member of the German empire, shares with Schwarzburg-Sondershausen the possessions of the old house of Schwarzburg, consisting of the upper barony (Oberherrschaft), in Thuringia, on the Gera, Ilm, and Saale, and the lower barony (Unterherrscaft), an isolated district on the Wipper and Helbe, about twenty-five miles to the north, surrounded by the Prussian province of Saxony. The chief grain crops are rye, oats, and barley, but thrice as much ground is occupied by potatoes as by all three of these together. Agriculture and forestry support about 35 per cent. of the population, and mining and cognate industries about 10 per cent. Trade and manufactures are insignificant; iron, lignite, cobalt, alum, and vitriol are among the mineral productions. In 1880 the population was 80,296 (an increase of 1,779 since 1875), or about 221 to the square mile. Of these 79,832 were Protestants.

SCHWARZBURG-SONDERSHAUSEN, a small Thuringian principality and an independent member of the German empire, shares the old Schwarzburg lands with Schwarzburg-Rudolstadt, as explained in the preceding article. Its total area is 333 square miles, of which 133 are in the upper and 200 in the lower barony. The chief towns are Arnstadt (10,516 inhabitants), which at one time gave name to a line of counts, in the latter district, and Sondershausen (6,110), the capital, in the former. The general description of the nature and resources of Schwarzburg-Rudolstadt applies also to this principality, except that 58 per cent. of the whole is devoted to agriculture and 30 per cent. to forests, only about two-fifths of which are coniferous trees. The chief crops are oats, barley, wheat, and rye; but here also by far the most land is planted with potatoes. About 39 per cent. of the population are supported by agriculture and forestry, and about 5 per cent. by mining. In 1880 the population was 71,107 (an increase of 3,627 since 1875), or about 213 to the square mile. Of these 70,450 were Protestants.

SCHWARZENBERG, Karl Philipp, Prince of, Austrian field-marshal, was born on April 15, 1771, at Vienna. He fought in 1789 under Lacy with distinction against the Turks and became major in 1792. In the French campaign of 1793 he held command of a portion of the advanced guard under the duke of Coburg, and in 1794 his impetuous charge at the head of a cavalry regiment greatly contributed to the victory of Cateau-Cambrésis. After the battle of Würzburg in

September, 1796, he was raised to the rank of major-general, and in 1799 to that of field marshal in command of a division. In 1813 he was appointed commander-in-chief of the allied forces, and, after defeating Napoleon at Leipsic in October, carried the campaign to a successful issue by entering Paris in March, 1814. On the conclusion of the war he became president of the Aulic Council. He died from paralysis at Leipsic, October 15, 1820.

SCHWEGLER, Albert, German historical, philosophical, and theological writer, was born at Michelbach in Würtemberg, February 10, 1819. Under Baur's influence he devoted himself to the study of ecclesiastical history, and his first work was *Der Montanismus u. die christliche Kirche des 2ten Jahrhunderts* (1841). In 1843 he commenced in the Tübingen university the career of a teacher (*privat-docent*) of philosophy and classical philology, and in 1848 was made extraordinary professor of the latter subject and soon after ordinary professor of history. His death took place on January 5, 1857.

SCHWEIDNITZ, a manufacturing and trading town of Lower Silesia in Prussia, is picturesquely situated on the left bank of the Weistritz, twenty-eight miles southwest of Breslau. The beer of Schweidnitz has long been famous under the name of "Schwarze Schöps," and in the sixteenth century it was exported as far as Italy. Schweidnitz is the chief grain market of the district. The population in 1885 was 23,775 (an increase of 6 per cent. since 1880); in 1816 it was 10,046.

SCHWEINFURT, a manufacturing town of Lower Franconia in Bavaria, is situated on the right bank of the Main, twenty-two miles northeast of Würzburg.

The population in 1880 was 12,601, of whom one-fourth were Roman Catholics.

SCHELM, a town of Westphalia, in Prussia, is situated on the river of the same name, twenty-two miles east of Düsseldorf and twenty-seven northeast of Cologne. It carries on iron-founding, wire-drawing, and the manufacture of machinery of various kinds, besides an active trade in iron, steel, and brass goods. Scarcely less important are its manufactures of ribbons, damask, cord, and paper. In the neighborhood are chalybeate springs resorted to by invalids. The population in 1880 was 12,127.

SCHWENKFELD, Caspar, of Ossing, as he called himself, from his property at this place, in the principality of Liegnitz, in Silesia, one of the first and noblest representatives of Protestant mysticism in the sixteenth century, was born in 1490. Though he was educated as a strict Catholic, the writings of Tauler and Luther produced a profound impression upon him, so that in 1522 he visited Wittenberg, where he made the acquaintance of Carlstadt and Thomas Münzer, spirits destined to be more congenial to him than Luther himself. On his return to Liegnitz he joined in an active propagation of the principles of the Reformation in the principality and in Silesia. But very early Schwenkfeld uttered warnings against the abuse of the doctrine of justification by faith. The Protestant controversy as to the Eucharist (1524) revealed his disagreement with Luther on that critical point. He sought to establish a *via media* between the doctrines of Luther and Zwingli, and vainly hoped to obtain for it Luther's acceptance. In 1535 a sort of compromise was brought about between himself and the Reformers, he promising not to disturb the peace of the church and they not to treat him as a disturber. The compromise was of only short duration. An attempt in 1543 to approach Luther only increased the Reformer's hostility and rendered Schwenkfeld's situation still more precarious. He and his followers withdrew from the Lutheran church, declined its sacraments, and formed small societies of kindred views. He and they were frequently condemned by Protestant ecclesiastical and political authorities, especially by the government of Würtemberg. His personal safety was thereby more and more imperiled, and he was unable to stay in any place for more than a short time. At last, in his seventy-second year, he died at Ulm, on December 10, 1561, surrounded by attached friends and declaring undiminished faith in his views.

SCHWERIN, a capital and one of the most attractive cities of the grand-duchy of Mecklenburg-Schwerin, is prettily situated at the southwest corner of the Lake of Schwerin (14 miles long and 3½ miles broad), 110 miles northwest of Berlin. Neither the manufacturing industry nor the trade of Schwerin is important. In 1885 the population was 32,031—including about 700 Roman Catholics and 400 Jews—an increase of 6.4 per cent. since 1880.

SCHWIND, Moritz von, a painter of the romantic school, was born in Vienna in 1804. In 1828 he removed to Munich, and had the advantage of the friendship of the painter Schnorr and the guidance of Cornelius, then director of the academy. In 1834 he received the commission to decorate King Louis' new palace with wall paintings illustrative of the poet Tieck. To him was intrusted in 1839, in the new Carlsruhe academy, the embodiment in fresco of ideas thrown out by Goethe. In 1847 Schwind returned to Munich on being appointed professor in the academy. In 1857 appeared his exceptionally mature "cyclus" of the Seven Ravens from Grimm's fairy stories. Schwind's genius was lyrical; he drew inspiration from chivalry, folk-lore, and the songs of the people; his art was decorative, but lacked scholastic training and technical skill. Schwind died at Munich in 1871, and his body lies in the old Friedhof of the same town.

SCHWYZ, one of the forest cantons of Switzerland, ranking fifth in the confederation. It extends from the upper end of the Lake of Zurich on the north to the middle reach of the Lake of Lucerne on the south; on the west it touches at Küssnacht the northern arm of the latter lake, and at Arth the Lake of Zug, while on the east it stretches to the ridges at the head of the Muottathal, which divide it from Glarus. Its total area is 350.7 square miles. In 1880 the population (nearly equally divided between the two sexes) was 51,235, an increase of 3,530 since 1870. The only towns of any size are Einsiedeln (population, 8,401) and the capital, Schwyz (6,543). German is the mother tongue of 49,631 of the inhabitants, and there is an Italian colony of 1,377. The Roman Catholics number 50,266, the Protestants but 954.

SCIACCA, a town of Italy, in the province of Girgenti, Sicily, twenty-eight miles southeast of Castelvetrano (Selinus) and thirty-seven northwest of Girgenti, lies on the south coast on a steep rocky decline, and with its walls and castles has from a distance an imposing appearance. The population was 21,451 (22,195 including Marina) in 1881.

Sciacca was the birthplace of Tommaso Fazello (1498–1570), the historian of Sicily. In the fifteenth century it was the scene of a terrible feud between the Perollos (lords of Sciacca) and the counts of Luna.

SCIATICA. See Neuralgia.

SCILLY ISLES, a group of islands, about forty in number, in the county of Cornwall, England, are situated about twenty-five miles west-by-south of Land's End and forty west from Lizard Point, in 50° N. latitude and 6° W. longitude. They are composed wholly of granite—outliers of the granite highlands of Cornwall. There are some metalliferous veins or lodes, but none that could ever have yielded much iron. On account of the mild climate the vegetation is remarkably luxuriant.

The total area of the islands is 3,560 acres, with a population in 1871 of 2,090, and in 1881 of 2,320. including 276 persons on board vessels.

SCINDE. See SIND.

SCIO, the Italian name of an island on the west coast of Asia Minor, called by the Greeks Chios. Scio, which is about thirty miles long from north to south, and varies in breadth from eight to fifteen miles, is divided into a larger northern part and a smaller southern part, called, respectively, *apanomeria* and *katomeria*. The island is rugged and well deserves the epithet "craggy" (παιπαλόεσσα), applied to it in the Homeric hymn. The southern part is less rocky than the northern, and the wealth of the island is concentrated there. The figs of Chios were noted in ancient times, but wine and gum mastic have always been its most important products.

The chief city of Chios has always borne the same name as the island. It is situated near the middle of the eastern coast, and at the present day contains about 17,000 inhabitants.

SCIPIO. The Scipios, a memorable name in Roman history, were a branch of the ancient and noble family of the Cornelii. It was in Rome's wars with Carthage that they made themselves specially famous.

1. PUBLIUS CORNELIUS SCIPIO, the father of the Elder Africanus, was the first Roman general to encounter Hannibal in battle. He was consul in 218 B.C., the first year of the Second Punic War, and, having Spain for his province, he went with an army to Massilia (Marseilles) with the view of arresting the Carthaginian's advance on Italy. In a sharp cavalry engagement in the upper valley of the Po, on the Ticinus, he was defeated and severely wounded. Again, in December of the same year, he witnessed the complete defeat of the Roman army on the Trebia. But he still retained the confidence of the Roman people, since his term of command was extended. The details of these campaigns are not accurately known to us, but it would seem that the ultimate defeat and death of the Scipios were due to the desertion of the Celtiberi, bribed by Hasdrubal, Hannibal's brother.

2. PUBLIUS CORNELIUS SCIPIO AFRICANUS THE ELDER.—After having been present at the disastrous battles of the Ticinus, the Trebia, and Cannæ, and having after that last crushing defeat had the spirit to remonstrate with several Roman nobles who advocated giving up the struggle and quitting Italy in despair, Scipio, at the age of twenty-four, offered to take the command of the Roman army in Spain the year after his father's death. The people already had an intense belief in him, and he was unanimously elected. All Spain west of the Ebro was in the year of his arrival (210) under Carthaginian control, but fortunately for him the three Carthaginian generals, Hasdrubal (Hannibal's brother), Hasdrubal the son of Gisgo, and Mago (also Hannibal's brother), were not disposed to act in concert. Scipio was thus enabled to surprise and capture New Carthage, the headquarters of the Carthaginian power in Spain, from which he obtained a rich booty of war stores and supplies, with a particularly good harbor. With the idea of striking a blow at Carthage in Africa, the Roman general paid a short visit to the Numidian princes, Syphax and Masinissa, but at the court of Syphax he was foiled by the presence of Hasdrubal, the son of Gisgo, whose daughter Sophonisba was married to the Numidian chief. The war was now to be transferred by Scipio from Italy to Africa. At the commissioners' bidding he sailed in 204 from Lilybæum (Marsala) and landed on the coast of Africa near Utica. Carthage meanwhile had secured the friendship of the powerful Numidian chief Syphax, whose advance compelled Scipio to raise the siege of Utica and to entrench himself on the shore between that place and Carthage. Next year he surprised and utterly defeated Syphax and drove the Carthaginian army out of the field. There was an attempt at negotiation, but the war party prevailed and Hannibal was recalled from Italy. The decisive battle was fought near the Numidian town of Zama in 202 and ended in Hannibal's complete defeat. Scipio was welcomed back to Rome with the surname of Africanus, and he had the moderation and good sense to refuse the many honors which the people would have thrust upon him. After all, however, he ended his days as a voluntary exile in all probability, at Liternum on the coast of Campania, dying, it would seem, in 183, the year of Hannibal's death, when a little above fifty years of age.

3. PUBLIUS CORNELIUS SCIPIO AFRICANUS THE YOUNGER. This Scipio, also one of Rome's greatest generals, was the younger son of Æmilius Paullus, and he fought when a youth of seventeen by his father's side at Pydna, 168—the battle which decided the fate of Macedonia and made northern Greece subject to Rome. He was adopted by the eldest son of Scipio Africanus the Elder, and from him took the name Scipio with the surname Africanus.

The Younger Scipio, great general and great man as he was, is forever associated with a hideous work of destruction at Carthage, which we feel he might have done more to avert. Yet he was a man of culture and refinement; he gathered round him such men as the Greek historian Polybius, the philosopher Panætius, and the poets Lucilius and Terence. And at the same time, according to Polybius and Cicero, he had all the good sterling virtues of an old-fashioned Roman, and steadily set his face against the increasing luxury and extravagance of his day. As a speaker he seems to have been no less distinguished than as a soldier. He spoke remarkably good and pure Latin, and he particularly enjoyed serious and intellectual conversation. There seems to have been nothing mean or grasping about him. After the capture of Carthage he gave back to the Greek cities of Sicily the works of art of which Carthage had robbed them. He did not avail himself of the many opportunities he must have had of amassing a fortune. Though politically opposed to the Gracchi, he cannot be said to have been a foe to the interests of the people. He was, in fact, a moderate man, in favor of conciliation, and he was felt by the best men to be a safe political adviser, while, as often happens in such cases, he could not help offending both parties.

4. Scipios are continually appearing in Roman history in more or less prominent positions down to the time of the empire. One of them, SCIPIO NASICA (Nasica denoting an aquiline nose), contemporary of the Younger Africanus, instigated the murder of Tiberius Gracchus, whom the people were bent on reëlecting (133) to the tribuneship. Though he was pontifex maximus at the time, the senate, to save him, had to get him away from Rome, and he left never to return, dying soon afterward in Asia.

SCIRE FACIAS, in English law, is a judicial writ founded upon some record directing the sheriff to make it known (*scire facias*) to the party against whom it is brought, and requiring the latter to show cause why the party bringing the writ should not have the advantage of such record, or why (in the case of letters patent and grants) the record should not be annulled and vacated. Proceedings in *scire facias* are regarded as an action, and the defendant may plead his defense as in an action. The writ is now of little practical importance.

SCOPAS. See Archæology.

SCORESBY, William, English arctic explorer and physicist, was born near Whitby, Yorkshire, on October 5, 1789. Young Scoresby made his first voyage with his father to Greenland in 1800, when he was only eleven years of age. On his return, up to 1803, he diligently pursued his education, acquiring a very fair knowledge of mathematics and navigation. From 1803 he was his father's constant companion to the whale-fishery. On May 25, 1806, as chief officer of the *Resolution* he succeeded in reaching 81° 30′ N. latitude in 19° E. longitude, the farthest point north attained by any navigator up to that date. In his voyage of 1813 Scoresby ascertained that the temperature of the polar ocean is warmer at considerable depths than it is on the surface. In 1819 he was elected a fellow of the Royal Society of Edinburgh, and among other papers of the year was one communicated to the Royal Society of London through Sir Joseph Banks, *On the Anomaly in the Variation of the Magnetic Needle*, touching upon a subject of the first scientific importance. In 1820 appeared Scoresby's *History and Description of the Arctic Regions*, in which he gathers up the results of his own observation, as well as those of previous navigators, and which still remains a standard authority.

After two years of residence in Cambridge, he, in 1825, was ordained, and, on July 17th, was appointed curate of Bassingby. Meantime had appeared at Edinburgh, in 1823, his *Journal of a Voyage to the Northern Whale-Fishery, including Researches and Discoveries on the Eastern Coast of Greenland*. In 1824 the Royal Society elected him a fellow, and the Paris Academy of Sciences an honorary corresponding member. From the first he was an active member and official of the British Association, to which he made several important contributions, one being "An Exposition of Some of the Laws and Phenomena of Magnetic Induction." In order to obtain additional data for his theories on magnetism he made a voyage to Australia in 1856, the results of which were published in a posthumous work—*Journal of a Voyage to Australia for Magnetical Research*. Scoresby was thrice married—the last time in 1849. After this third marriage Scoresby built a villa at Torquay, where he spent the remainder of his life, and where he died, March 21, 1857. He was a man of simple but deep piety, amiable, cheerful, and guileless.

SCORPION. See Arachnida.

SCOT, Michael, whose fame as a magician has surrounded his history with legend, is sometimes claimed by the Italians as a native of Salerno and by the Spaniards as a native of Toledo; but there is no reason to doubt the Scottish origin to which his name testifies. Scottish tradition is unanimous in identifying him with Sir Michael Scot of Balwearie in Fifeshire, but the ascertainable dates place some difficulties in the way of this. The traditional date of Scot's birth is 1190. Michael is said to have foretold (after the double-tongued manner of the ancient oracles) the place of Frederick's death, which took place in 1250. The Italian tradition makes Scot die in Sicily not long afterward, stating that he foretold the manner of his own death. Jourdain is inclined to agree with this approximate date, observing that Scot is spoken of by Albert the Great as if he were already dead, and that Vincent of Beauvais, who died about 1268, quotes him with the epithet "vetus." But the generally received tradition makes him return by way of England (where he was received with much honor by Edward I.) to his native country. The ordinary account gives 1291 as the date of Scot's death. He used to feast his friends with dishes brought by spirits from the royal kitchens of France and Spain and other lands. His embassy to France alone on the back of a coal-black demon steed is also celebrated, in which he brought the French monarch to his feet by the effects which followed the repeated stamping of his horse's hoof. Other powers and exploits are narrated in Folengo's Macaronic poem of *Merlin Coccaius* (1595). But Michael's reputation as a magician was already fixed in the age immediately following his own. He appears in the *Inferno* of Dante among the magicians and soothsayers.

> "Quell' altro, che ne' fianchi e cosi poco
> Michele Scotto fu; che veramente
> Delle magiche frode seppe il giuoco."

[That other, round his loins so slender in his shape, was Michael Scott, practiced in every stratagem of magic wile.]

He is represented in the same character by Boccaccio, and is severely arraigned by John Pico de Mirandolo in his work against astrology, while Naudé finds it necessary to defend his good name in his *Apologie pour les grands personnages faussement accusés de magie*.

SCOT, Reginald, born about 1538, was the son of Richard, third son of Sir John Scot of Scotshall, Smeeth (Kent), studied at Hart Hall in Oxford, and afterward lived in studious retirement at Smeeth, dying in 1599. He was the author of a very remarkable book, *The Discoverie of Witchcraft*, the object of which was to put an end to the cruel persecution of witches, by showing that "there will be found among our *Witches* only *two sorts;* the *one sort* being such by imputation, as so thought of by others (and these are abused and not abusers), the *other* by *acceptation*, as being *willing* so to be *accounted*, and these be meer *Coseners*."

SCOTER, a word of doubtful origin, perhaps a variant of "Scout," one of the many local names shared in common by the Guillemot and the Razorbili, or perhaps primarily connected with Coot, the English name of the *Anas nigra* of Linnæus, which with some allied species has been justifiably placed in a distinct genus, *Œdemia* (often misspelt *Oidemia*)—a name coined in reference to the swollen appearance of the base of the bill. The Scoter is also very generally known around the British coast as the "Black Duck" from the male being, with the exception of a strip of orange that runs down the ridge of the bill, wholly of that color. In the representative American form, *Œ. americana*, the protuberance at the base of the bill, black in the European bird, is orange as well. Of all Ducks the Scoter has the most marine habits, keeping the sea in all weathers, and rarely resorting to land except for the purpose of breeding.

SCOTLAND. 1. *Roman Period.*—The first certain lines of the history of Scotland were written by the Romans. Their account of its partial conquest and occupation for more than three hundred years gives the earliest facts to which fixed dates can be assigned. The invasion commenced by Julius Cæsar reached in Agricola's last campaign limits afterward never exceeded. It was in the last year of Vespasian's life that Julius Agricola, the ablest general bred in his camp, came to command the army in Britain. Landing in midsummer, 78, he at once commenced a campaign against Wales. In his second campaign he passed the Solway and, defeating the tribes of Galloway, introduced rudiments of Roman civilization in the district where Ninian taught the rudiments of Christianity three centuries later. This was the first conquest within modern Scotland.

The indefatigable Hadrian came to Britain (120) with the VIth legion, named Victrix, which replaced the IXth. He began, and his favorite general Aulus Plautorius Nepos completed, between the mouth of the

Tyne near Newcastle and the Solway near Carlisle, the great wall of stone, about eighty miles in length, sixteen feet high, and eight feet thick, protected on the north by a trench thirty-four feet wide and nine feet deep, with two parallel earthen ramparts and a trench on the south—proving the line required defense on both sides. Massive fragments of the wall, its stations, castles, and protecting camps, with the foundation of a bridge over the North Tyne, may be still seen. It was garrisoned by the VIth legion, and by the XIth and XXth, which remained throughout the whole Roman occupation. The conquests of Agricola in what is modern Scotland were for a time abandoned.

From the death of Severus to the accession of Constantius Chlorus, a period of nearly a century, the history of northern Britain is unknown. In the first (305) of the two years of his reign Constantius defeated the tribes between the walls called by Eumenius the Panegyrist "the Caledonians and other Picts"—a name now first heard—and by this association identified with the Caledonians. Next year Constantius died at York; and for more than fifty years a veil is again drawn over northern Britain. It was during this period that Constantine was converted to Christianity, which his father Constantius had favored during the persecutions of Diocletian. So rapid was the progress of the church in the British province that only ten years after the martyrdom of St. Alban, Celtic bishops of York, London, and Caerleon—probably the place of that name on the Usk—were present at the council of Arles. In 360 the Scots are for the first time named, by Ammianus Marcellinus, who records their descent along with the Picts upon the Roman province in terms which imply that they had before passed the southern wall. Four years later the Picts, Saxons, Scots, and Attacots are said by the same writer to have caused the Britons perpetual anxiety; but Theodosius, father of the emperor of the same name, repulsed them and recovered the country between the walls, which became (368) a fifth province of Britain, called in honor of the reigning emperor Valenta. It remained so for a very brief space; the revolt of Maximus (391), which reduced the Roman troops to two legions, led to fresh raids of the Picts and Scots. A legion sent by Stilicho drove them back to the northern wall. But it was soon recalled, and the garrisons were permanently removed prior to 409.

2. *Early Celtic Period to Union of Picts and Scots by Kenneth Macalpine.*—It is to the Celts, the first known inhabitants of Britain, that our inquiry next turns. This people were not indigenous, but came by sea to Britain. A conjecture, not yet proved, identifies as inhabitants of Britain before the Celts a branch of the race now represented in Europe only by the Basques.

The Picts, a Latin name for the northern tribes who preserved longest the custom of painting their bodies, called themselves Cruithne. Their original settlements appear to have been in the Orkneys, the north of Scotland, and the northeast of Ireland—the modern counties of Antrim and Down. They spread in Scotland, before or shortly after the Romans left, as far south as the Pentland Hills, which, like the Pentland Firth, are thought to preserve their name, occupied Fife, and perhaps left a detachment in Galloway. Often crossing, probably sometimes using, the deserted wall of Hadrian, they caused it to acquire their name—a name of awe to the provincial Britons and their English conquerors. Their language, though Celtic, is still a problem difficult to solve, as so few words have been preserved. Its almost complete absorption in that of the Gaels or Scots suggests that it did not differ widely from theirs, and with this agrees the fact that Columba and his followers had little difficulty in preaching to them, though they sometimes required an interpreter. Some philologists believe it to have been more allied to Cymric, and even to the Cornish variety; but the proof is inconclusive.

The Scots came originally to Ireland, one of whose names from the sixth to the thirteenth century was Scotia: Scotia Major it was called after part of northern Britain in the eleventh century had acquired the same name. Irish traditions represent the Scots as Milesians from Spain. Their Celtic name Gaidhil, Goidel, or Gael appears more akin to that of the natives of Gaul. They had joined the Picts in their attack on the Roman province in the fourth century, and perhaps had already settlements in the west of Scotland; but the transfer of the name was due to the rise and progress of the tribe called Dalriad, which migrated from Dalriada in the north of Antrim to Argyll and the Isles in the beginning of the sixth century. Their language, Gaidhelic, was the ancient form of the Irish of Ireland and the Gaelic of the Scottish Highlanders. No clear conclusion has been reached as to the meaning of Briton, Cruithne, Scot, and Gael.

The order of the arrival of the three divisions of the Celtic race and the extent of the islands they occupied are uncertain.

It is in the records of the Christian church that we first touch historic ground after the Romans left. Although the legends of Christian superstition are almost as fabulous as those of heathen ignorance, we can follow with reasonable certainty the conversion of the Scottish Celts. Three Celtic saints venerated throughout the Scottish history—Ninian, Kentigern, Columba—Patrick, the patron saint of Ireland, David, the patron saint of Wales, and Cuthbert, the apostle of Lothian and patron saint of Durham, belonging to the Celtic Church, though probably not a Celt, mark the common advance of the Celtic races from heathenism to Christianity between the end of the fourth and the end of the sixth century.

When we pass to civil history our knowledge is restricted to a list of names and battles; but the labors of recent scholars allow a brief account of the Celtic races from the end of the sixth to their union in the middle of the ninth century, in part hypothetical, yet a great advance on the absolute blank which made historians of the eighteenth century decline the task in despair.

The Britons, whose chief king had ruled at Alclyde, were separated from their fellow-countrymen, the Cymry in Wales, shortly after Columba's death, by the rapid advance of the Anglian kingdom of Northumberland, founded in the middle of the sixth century by Ida of Bamborough. One of his successors, Ethelfred, struck the blow, completed by the wars of the next king, Edwin, which severed modern Wales from British Cumbria and Strathclyde.

Of the Scots of Dalriada somewhat more is known. Their history is interwoven with that of the Picts and meets at many points that of the Angles of Northumberland, who, during the seventh and the beginning of the eighth century, when their kings were the greatest in Britain, endeavored to push their boundaries beyond the Forth and the Clyde. The history of this kingdom forms part of that of Scotland during these centuries. It planted in Lothian the seed from which the civilization of Scotland grew.

Before its fall Northumberland produced three great men, the founders of English literature and learning, though two of them wrote chiefly in Latin—Cædmon, the monk of Whitby, the first English poet; Bede, the monk of Jarrow, the first English historian; and Alcuin, the monk of York, whose school might have become the first English university, had he not lived in the decline of Northumbrian greatness and been attracted to the court of Charlemagne. It is to this early dawn of talent among the Angles of Northumberland that England owes its name of the land of the Angles and its language that of English.

The annals of Dalriada are more perplexing than those of the Picts after the middle of the sixth century. There is the usual list of kings, but they are too numerous, and their reigns are calculated on an artificial system. The forty kings from Fergus MacEarc to Fergus MacFerchard, who would carry the date of the Scottish settlement back to three centuries at least before the birth of Christ, have been driven from the pale of history by modern criticism. The date of the true settlement was that of the later Fergus, the son of Earc, in 503. From that date down to Selvach, the king who was conquered by Angus MacFergus about 730, the names of the kings can be given with reasonable certainty from Adamnan, Bede, and the Irish *Annals*. But the subsequent names in the Scottish chronicles are untrustworthy, and it is an ingenious conjecture that some may have been inserted to cover the century following 730, during which Dalriada is supposed to have continued under Pictish rule. This view is not free from its own difficulties. It is hard to explain how Kenneth Macalpine, called by all Scottish records a Scot, though in Irish *Annals* styled (as are several of his successors) king of the Picts, succeeded in reversing the conquest of Angus MacFergus and establishing a Scottish line on the throne of Scone, in the middle of the ninth century. This difficulty is supposed to be solved by the hypothesis that Kenneth was the son of a Pictish father, Alpine, but of a Scottish mother, and was entitled to the crown by a peculiarity of Pictish law, which recognized descent by the mother as the test of legitimacy. The records which speak of the destruction of the Picts are treated as later inventions, and it is even doubted whether the connection between Alpine and Kenneth and the older race of Dalriad kings is not fictitious.

Whatever may be the solution ultimately reached as to Kenneth Macalpine's antecedents, his accession represents a revolution which led by degrees to a complete union of the Picts and Scots and the establishment of one kingdom—at first called Albania and afterward Scotia—which included all Scotland north of the Forth and Clyde, except Caithness, Sutherland, Orkney, and Shetland (the northern isles or Nordreyar), the Hebrides (the southern isles or Sundreyar), and Man; these fell for a time into the hands of the Norsemen. Kenneth Macalpine's reign of sixteen years (844–860) was a time of incessant war. He invaded Saxony (Lothian) six times, burnt Dunbar, and seized Melrose (already a rich abbey, though on a different site from the Cistercian foundation of David I.), while the Britons (of Strathclyde) burnt Dunblane and the Danes wasted the land of the Picts as far as Cluny and Dunkeld. After they left Kenneth rebuilt the church of Dunkeld and replaced in it Columba's relics. He died at Forteviot and was buried at Iona.

He was succeeded by his brother Donald I. (861–863), who, with his people the Gaels, established the laws of Aed, son of Eachdach, at Forteviot. Aed was a Dalriad king of the eighth century; but the contents of his laws are unknown. Perhaps tanistry, by which the successor to the king was elected during his life from the eldest and worthiest of his kin, usually a collateral in preference to a descendant, was one feature, for it certainly prevailed among the Irish and Scottish Gaels. The next king, who succeeded in accordance with that custom, was Constantine I. (863–877), son of Kenneth. His reign was occupied with conflicts with the Norsemen. His death led to a disputed succession. His heir, according to the custom of tanistry, was his brother Aodh, who was killed by his own people after a year. Eocha, the son of Run, a king of the Britons, claimed in right of his mother, a daughter of Kenneth, according to the Pictish law, and governed at first along with Ciric or Grig, his tutor; then Grig ruled alone, until they were both expelled from the kingdom and Donald II., son of Constantine, came to the throne (889). In the reign of Donald II. (889-900), son of Constantine I., Scotland was again attacked by the Norsemen. Sigurd, the Norse earl of Orkney, seized Caithness, Sutherland, Ross, and part of Moray, where he built the fort of Burghead, between the Findhorn and the Spey. Farther south the Danes took Dunnottar, where Donald was slain. After his time the name of the kingdom of Scone was no longer Pictavia, but Albania or Alba, a more ancient title of northern Scotland, perhaps resumed to mark the growth of the Scottish-Pictish monarchy in the central and eastern Highlands.

Donald II. was followed by Constantine II. (900-940), son of Aodh and grandson of Kenneth, and his long reign is a proof of his power. He was the greatest Scottish king, as Angus MacFergus had been the greatest of the pure Pictish race.

Constantine's successor, Malcolm I. (943–954), son of Donald II., began his reign by invading Moray and killing Cellach, its chief king. Meantime the Danish kings of Dublin had been endeavoring to maintain their hold on Northumberland with the aid of the Cumbrians, whose country they had already settled, and in this attempt the two Olafs had a temporary success; but Eadmund, the successor of Athelstan, expelled Olaf, son of Sitric, from Northumberland, and in the following year, to prevent the Cumbrians from again aiding the Danes, he "harried Cumberland and gave it all up to Malcolm, king of Scots, on condition that he should be his fellow-worker both on sea and land."

Kenneth II. (971–995), son of Malcolm, soon after his accession made a raid on Northumberland as far south as Cleveland. At this time, in the north and west, the Orkney earls were all-powerful, and Kenneth was occupied with contests nearer his own territory—especially with the mormaer of Angus, whose grandson, through his daughter Fenella, he slew at Dunsinane, and in revenge for which he was himself treacherously killed at Fettercairn in Mearns by Fenella, whose name is still preserved in the traditions of that district. The foundation of the church at Brechin is attributed to this king.

Kenneth was followed, as he had been preceded, by insignificant kings—Constantine, son of Colin, and Kenneth, son of Duff. His son Malcolm II. (1005–34), gained the throne by the slaughter of his predecessor Duff at Monzievaird, and at once turned his arms southward; but his first attempt to conquer northern Northumberland was repelled by Ethelred, son of Waltheof, its earl, who defeated him at Durham. Profiting by the distracted state of northern England, Malcolm again invaded Northumberland with Owen of Cumbria, called the Bald, and by the victory of Carham (1018) near Coldstream won Lothian, which remained from that time an integral part of Scotland.

Malcolm II. was succeeded by his grandson Duncan (1034–40), son of his daughter Bethoc and Crinan, a lay or secular abbot of Dunkeld. Duncan, after an unsuccessful attempt on Durham, turned his arms to the north to check the further advance of his kinsman, but was defeated on the Pentland Firth. Moddan, whom he had tried to set up as earl of Caithness, was burnt in his own house, and Duncan himself was killed at Bothgownan near Elgin by Macbeth, his own general. Macbeth was son of Finlay, mormaer of Moray, and his wife Gruoch was daughter of Boete, son of Kenneth II.; thus he had a possible pretension to the crown if it could descend by females. But his real position appears to have been that of a successful general asserting the independence of the northern Celts against Duncan, who, by his marriage with the daughter of Earl Siward, the Northumbrian earl, had shown the tendency to unite Saxon with Celtic blood which was followed by his son Malcolm (III.) Canmore. Macbeth reigned seventeen years (1040–57). He was, as far as records state, an able monarch; but he fell at last in the battle of Lumphanan in Mar, where the young Malcolm was aided by Tostig, son of Godwine, the great West Saxon earl who had become earl of Northumberland. A few months later Lulach, the son of Gillecomhain, a former mormaer of Moray, who had continued the war, and is nominally counted a king, though called fatuous, was slain at Essie in Strathbogie (N. W. Aberdeen), and Malcolm Canmore became king. With his reign a new and clearer era of the history of Scotland commences.

4. Transition from a Celtic to an Anglo-Norman Feudal Monarchy: Malcolm Canmore and his Descendants.—Canmore ascended the throne (1058) not long before England was subjugated by William the Conqueror. The only recorded event of his reign prior to the Conquest was his quarrel with Tostig, his "sworn" brother, when he made a raid south of the Tweed and violated the peace of St. Cuthbert by ravaging Lindisfarne. The early years of his reign were devoted to establishing his rule in the northern districts, where his marriage to Ingebiorg, widow of Earl Thorfinn, related by the Norse but not the Scottish writers, may have aided him. The victory of Hastings brought to the Scottish court as refugees Edgar Atheling, grandson of Edmund Ironside, and his three sisters. Their father, Edward, had found shelter in Hungary in the reign of Canute and married an Hungarian princess. The eldest daughter of the marriage, Margaret, became the wife (1068) of Malcolm Canmore. Her virtues more than his wars make his reign an epoch of Scottish history. Malcolm twice harried Northumberland during the reign of the Conqueror with the view of restoring the Atheling. In the interval between these expeditions William retaliated by invading Scotland as far as Abernethy, where he forced Malcolm to do homage.

After Malcolm's death there was a fierce contest for the crown (1093–97), which showed that the union of Celtic and Saxon blood was not yet complete in the royal house, much less in the nation. Before the corpse of Margaret could be removed to Dunfermline for burial, Donald Bain, brother of Malcolm Canmore, besieged the castle, and its removal was only accomplished under cover of mist. Donald, who had the support of the Celts and the custom of tanistry in favor of his claim, was king nominally at least six months, when he was expelled by Duncan, son of Malcolm and Ingebiorg, assisted by an English force, in which there were Normans as well as Saxons; but his tenure was equally short, and Donald, aided by Edmund, the only degenerate son of Malcolm and Margaret, who slew his half-brother, Duncan, again reigned three years. This was the last attempt of the Celts—though partial risings continued frequent—to maintain a king of their race and a kingdom governed according to their customs. Edgar Atheling, who had become reconciled to the Norman king, led an army into Scotland and by a hard-fought battle dispossessed Donald and restored his eldest nephew, Edgar, to his father's throne.

The reign of Edgar (1097–1107) was unimportant. Its chief event was the cession of the Sudreyar or islands on the west coast to the Norse king, Magnus Barefoot, who also conquered Man and Anglesea.

Edgar, dying childless, was succeeded by his brother, Alexander I. (1107–24). Alexander was a learned monarch, like his father-in-law, Henry Beauclerk, pious and friendly to the church, but severe to his subjects.

David I. (1124–53), the youngest son of Malcolm and Margaret, became king at the ripe age of forty-four. He had been trained at the court of Henry I. and his sister Matilda, so that "his manners were polished from the rust of Scottish barbarity." After Edgar's death he served an apprenticeship for the royal office as earl or prince of Cumbria, where his power was little short of regal. He married a Saxon, the daughter of Waltheof, earl of Northumberland, widow of Simon de St. Liz, Norman earl of Northampton, and his friends and followers were chiefly Norman. His marriage brought him the earldom of Huntingdon, and he was guardian of the earldom of Northampton during his stepson's minority, so that he entered into feudal relations with the Norman king of England. In the government of his principality he succeeded in reducing a wild part of Scotland into order, using for this purpose the agency of the church.

David's grandson and successor, Malcolm IV. (1154–65), called "The Maiden," died too young to leave a permanent impression. Malcolm, dying childless—though he had an illegitimate son who predeceased him—was succeeded by his brother William the Lion (1165–1214). His reign, the longest of any Scottish monarch, though not so uniformly successful as that of his grandfather, was an important era in Scottish history. It is divided into nearly equal portions by the accession of Richard Cœur de Lion. The first consists of the war with Henry II., in which William was captured (1175), and this made him the subject of the English king for fourteen years. In the second he recovered his independence, and, resuming the task of his predecessor, consolidated the Scottish kingdom in the north and west. William commenced his reign by taking part in the war with France as vassal of Henry II. for the fief of Huntingdon; but, being disappointed of the promised restoration of the northern earldoms, he entered into negotiations with Louis VII. of France. This memorable event is the first authentic connection between Scotland and France, and was afterward antedated by a fiction to the time of Charlemagne. France proved a broken reed to the Scottish kings; but the intercourse between the two countries brought the Scottish people, when war with England after the close of the fourteenth century shut them out from the advancing civilization of that country, into contact with the chivalrous manners of the court and the learning of the schools of France during the best period of French history.

The second part of William's reign was occupied with internal affairs. Richard's absence and John's disputes with the pope and his own barons gave a relief from English war. The raising of the ransom tried the resources of Scotland, and was met by an aid from the clergy and barons. Risings by Harold, earl of Caithness, and his son Torphin (1197), and another by Guthred (1211), a descendant of the mormaer of Ross, were quelled. The birth of a son strengthened William's throne. William died at Stirling in 1214 in the seventy-second year of his age.

Alexander II. (1214–49), son of William, was crowned at Scone in his seventeenth year, in time to take part in the great struggle in England for Magna Charta, which had reached its crisis. He sided with the English barons, who made an agreement by which Carlisle and the county of Northumberland were to be given to Alexander. Like his predecessors, he was a benefactor of the church, especially of the new mendicant orders, whose monasteries were founded in all the principal towns. The most important of his statutes were the substitution of trial by jury for the ordeals of fire and water, and the regulation of trial by battle, with provision for the case of women and the clergy. He was deemed, like David, a protector of the poor.

Alexander III. (1249–85) was only eight years old when his father died. A succession of contests for the regency between a party of nobles who favored English influence and a national party was the consequence. In the Barons War Alexander aided his father-in-law, on whose side three Scottish barons, John Comyn, Robert Bruce, and John Baliol, fought at Lewes, where the first two were taken prisoners. In the matter of the independence of his kingdom Alexander was as firm as his predecessors, and would not allow Henry himself or the legate Ottobon to collect within it a tithe for the crusade which the pope had guaranteed to the English king. On the accession of Edward I. (1272) Alexander attended his coronation, but neither then nor six years later, when specially summoned to Westminster, would he do homage for Scotland. His only daughter, Margaret, married two years before to Erik of Norway, and his elder son, Alexander, both died in 1283. The following year the estates at Scone recognized the succession of Margaret, the Maid of Norway; but Alexander, in hope of a male heir, married Joleta, daughter of Count de Dreux. At the festivities in Jedburgh in honor of the marriage a ghostly figure in the masque was deemed an omen of the king's death, which followed from a fall near Kinghorn (1285).

5. *War of Independence; from Death of Alexander III. to Accession of House of Stuart.*—The Maid of Norway, whose right was at once acknowledged (for Scotland, like England, knew no Salic law), was not to wear the crown. A regency administered the kingdom for five years after Alexander's death. A conference at Salisbury between commissioners of Erik of Norway, Edward I., three of the regents, and Bruce, lord of Annandale, agreed that Margaret should be sent home unbetrothed. Her marriage to Edward's son, for which a dispensation had been got from Rome, was sanctioned by an assembly at Brigham near Roxburgh (July 18, 1290), in a treaty which made anxious provision for the independence of Scotland. This country was to remain free, and, saving the right of the king of England in the marches or elsewhere, separate from England by its lawful bounds. No parliament was to sit, and no Scottish suit to be tried, out of Scotland. Edward confirmed this treaty by oath; but the death of Margaret in the Orkneys rendered it abortive. To prevent an armed contest for the crown, Fraser, bishop of St. Andrews, invited Edward to intervene, and certain Scottish nobles made a similar request. He accordingly summoned the Scottish estates to meet him on May 10th, and the English parliament on June 3, 1291, at Norham near Berwick. When the Scots came Edward refused to judge the cause of the Scottish succession unless his title as superior of Scotland was admitted. After some delay the barons and clergy gave the admission, as also did the claimants—no fewer than thirteen—but the representatives of the commons withheld any such acknowledgment. The court for the decision of the cause was then appointed. Forty members were named by Baliol and as many by Bruce, between whom the competition really lay, while Edward chose twenty-four. On the following day the competitors agreed that sasine of the kingdom should be given to Edward; a week later the regent surrendered the kingdom of Scotland, and the keepers the chief castles into his hands as lord paramount. He restored possession after adding several Englishmen to the regency. After another adjournment the competitors put in their claims. Three descendants of David, earl of Huntingdon, brother of William the Lion—all English barons, though one, Bruce, had large estates in Scotland—were alone serious: John Baliol claimed as grandson of David's eldest daughter Margaret, wife of Alan, lord of Galloway; Robert Bruce as son of David's second daughter, wife of the lord of Annandale; while David de Hastings, grandson of the third daughter Ada, contended that the kingdom was partible. This last question was postponed until the claims of Baliol and Bruce had been considered. After two long adjournments it was at last decided (October 14, 1292) that the case was to be ruled by the law of the kingdom applicable to titles of earldoms, baronies, and other indivisible inheritances, and "that by this law in every heritable succession the more remote by one degree descended from the eldest sister was preferable to the nearer in degree from the second." Edward accordingly decided (November 17, 1292) in favor of Baliol. Two days afterward the regents were ordered to give sasine to Baliol; the day following he swore fealty to Edward at Norham; ten days after he was crowned at Scone; within a month he did homage to Edward at Newcastle.

This impotent monarch was carried captive with his son to London and vanishes from Scottish history. He died at one of his French fiefs twenty years afterward, never having attempted to regain the kingdom.

When the fortunes of Scotland were at the lowest, when the country was deserted by the king, and its nobles and clergy were making terms with the conqueror, Wallace, the man of the people, appeared. The second son of Sir Malcolm Wallace of Elderslie near Paisley, his name indicates a remote Celtic origin from a Welsh or Cambrian stock. In the spring of 1297, in revenge for the murder of his wife, Wallace slew Hazelrig, sheriff of Ayr, and burned Lanark. Collecting a band of followers animated with like patriotism, and aided by a single noble, Sir William Douglas, he surprised and drove Ormsby, the justiciar, from Scone, and Beck, the bishop of Durham, from Glasgow. Some of the barons, headed by James the Steward, joined him, and Wallace and Douglas carried everything before them in Lennox and Galloway—districts more favorable to the national cause than Lothian. The nobles fell away from Wallace almost as soon as Percy appeared at the head of an English force, and Douglas, the Steward, Bruce the future king, and others capitulated at Irvine (July 9, 1297). Wallace, while engaged in the siege of the castle of Dundee, heard that Surrey and Cressingham were advancing on Stirling, and he marched to its relief. There at the bridge over the Forth near Cambuskenneth he won his most famous victory (September 11th). The English were totally routed and Cressingham was killed. The disparity of numbers was great, for the English had 50,000 foot and 1,000 horse, against at most 40,000 foot and only 180 horse. The generalship of Wallace, who tempted his adversary to cross the bridge in his face and held his troops in hand until the moment of the charge, won the day, the first in which a feudal army was beaten by light-armed peasants. Wallace attempted to organize the kingdom he had won. He assumed the title of guardian of the realm in name of the Lord John (Baliol), and associated with himself Sir Andrew Moray of Bothwell, son of the only baron who stood by him and who fell in the battle. He held the nobles in awe, while he rewarded his adherents. The grant (fortunately preserved) of the office of constable of Dundee to Alexander Scrymzeour can scarcely have been a solitary one. He introduced better discipline in the army, and tried also to revive trade. Shortly after the battle of Stirling Wallace carried the war as far as Hexham, whose monks he protected. That he penetrated farther south and won the favor of Eleanor, Edward's wife, is one of the romantic additions to his scanty history in the poem of Blind Harry. Edward recognized the crisis, and, leaving Flanders, sent a force before him under Pembroke, following in person at the head of 80,000 foot and 10,000 horse. For a brief space success attended Wallace, who defeated the English in Fife and Ayr; but the bishop of Durham retook the castle of Dirleton, and Edward himself, by the victory of Falkirk (July 22, 1298), in which the nobles again proved false to the popular cause, reversed that of Stirling. Wallace took refuge in France, and, although the French king at Amiens offered to surrender him, he was soon released and provided with a safe conduct to the pope. Papers found on him when captured show that he received similar letters from Haco of Norway and Baliol. Whether he went to Rome is not certain, but he may have been one of the Scots who at this time induced Boniface VIII. to claim the superiority of Scotland. The claim was indignantly repelled by the English barons at the parliament of Lincoln; Edward, however, thought it prudent to lay before the pope a statement in which he advanced not only the instances of homage collected for use at Norham but the fable of Brute the Trojan, from whose eldest son Locrinus he claimed descent, and therefore superiority over the Scottish kings sprung from Albanactus the second as well as those of Wales descended from Camber the third. Baldred de Bisset, the Scottish commissioner at Rome, in his answer admitted the pope's right, but replied to Edward's fiction by another as bold—the descent of the Scots from Scota, the daughter of Pharaoh. A more solid argument was founded on the treaty of Brigham. The pope delayed judgment, and in 1302 suddenly changed sides and exhorted the Scots, by several bulls, to submit. Edward had not waited for this sanction; the period between the battle of Falkirk and the taking of Stirling was a continuous and bloody struggle. In person he laid waste Galloway and took Caerlaverock (1300); in 1302, his general Sir John Segrave, having fought a battle of doubtful issue with Comyn and Fraser at Roslin, Edward returned (1302), marched as far as Caithness, and reduced the whole east of Scotland by the capture of Stirling (January 24, 1304). Scotland was subdued, yet Wallace lived, and we catch glimpses of him, in the woods of Dunfermline, in the forest of Ettrick, in the neighborhood of Lanark. A price was set on his head, and at last he was betrayed by a servant of John de Menteith near Glasgow and taken to London, where, after a mock trial in Westminster Hall, he received the traitor's doom (August 23, 1305), though he denied with truth that he had taken any oath to Edward.

This time Edward, in order to make the conquest of Scotland permanent, proceeded to incorporate it in the empire of England. With apparent fairness an assembly was summoned to Perth to elect ten representatives to attend a parliament at Westminster to treat of the affairs of Scotland. Nine commissioners came to London, where they were associated with twenty Englishmen. The result was the "Ordinacio facta per dominum regem pro stabilitate terræ Scotiæ" (1305). Though never fully carried out, this document, on the model of similar ordinances for Wales and Ireland, discloses Edward's designs. English nobles were appointed to administer the government of the country, and eight justices to administer the law. The law and usages of Scotland (except those of the Brets and Scots, which were abrogated) were to be observed in the meantime; but the lieutenant (John of Brittany, the king's nephew) and council were to amend what was contrary to God and reason, or in case of difficulty refer to Edward at Westminster. The whole country was divided into sheriffdoms, the sheriffs being removable at the descretion of the lieutenant. The office of coroner, more important then than now, was also regulated; certain persons were nominated constables of the chief castles and many nobles were fined and others banished. Bruce (the competitor's grandson) was ordered to put Kildrummy Castle (Aberdeen) in charge of an officer for whom he should be responsible. The ordinance was suitable to its object—moderate, even humane. The banishment of the nobles was limited as to time. Relief was given in the payment of fines. Many old officers were continued. Edward's aim at this time was to pacify the country he had conquered, to put down resistance, but to encourage submission. It is as wrong to call him a tyrant as Wallace a rebel: the one was a statesman king with imperialist aims, the other a patriot leader with keen popular sympathies. The king triumphed; but before his death his well-laid plans were shattered; Scotland again rose in arms, and this time the nobles joined the people, under the leadership of Robert the Bruce.

The position, as well as the character, of Bruce contrasted with that of Wallace. Instead of being a cadet of the ordinary landed gentry, Bruce represented a family in which for more than two centuries the purest Norman blood had flowed. The English branch of Skelton in Cleveland and the Scottish branch of Annandale divided their large possessions; but those of the latter sufficed to make its head one of the most powerful nobles in Scotland, who still retained, as so many did, English fiefs. More than one of his ancestors had intermarried with the royal house of Scotland (see ROBERT THE BRUCE). On his father's death Bruce succeeded to Annandale. He held besides several manors in England. During the early part of the War of Independence, like many barons with conflicting interests, he had wavered, sometimes supporting Wallace, more frequently the English king. In 1303–4 he assisted Edward in the preparation for the siege of Stirling. He had been consulted with regard to the ordinance of 1305. But there were already signs of mutual distrust. The provision in the ordinance as to Kildrummy shows that Edward was aware special precautions had to be taken to secure the loyalty of Bruce, and on June 11, 1304, Bruce secretly met near Cambuskenneth Lamberton, bishop of St. Andrews, and entered into a bond referring to future dangers from Edward. Of all the Scottish clergy Lamberton had been most friendly to Wallace, and this bond was a link between the two periods of the War of Independence and their leaders. Bruce had attended at Westminster when the ordinance was settled, but left suddenly, arriving at Dumfries on the seventh day. There he met in the church of the Friars Minor John (the Red) Comyn of Badenoch, Baliol's nephew, and slew him before the high altar (February 10, 1306). The die was cast, and indecision vanished from the character of Bruce. Collecting his adherents at Lochmaben and Glasgow, he passed to Scone, where he was crowned by the bishop of St. Andrews. It at first seemed likely that a saying of his wife would prove true, that he was a summer but would not be a winter king. His defeat at Methven (June 19, 1306) was followed by another at Strathfillan (August 11th), and Bruce took refuge in the island of Rathlin (off Antrim, Ireland).

The tales of his hairbreadth escapes, his courage and endurance in all changes of fortune, were gathered by Barbour from the mouths of the people, who followed the life of their champion with the keenest interest. Meanwhile Edward came north and gave a foretaste of his vengeance. But his severity strengthened the party of Bruce, which grew daily. All classes now made, with few exceptions, common cause against the enemy of all. Edward's death at Burgh-on-Sands (June 7, 1307) at once changed the whole aspect of the invasion. Edward II. wasted in the ceremony of a funeral and the diversions of a youthful court the critical moment of the war. Bruce seized his opportunity, and by the close of 1313 Berwick and Stirling alone remained English. The independence of Scotland was finally determined by the ever-memorable victory of Bannockburn (June 24, 1314).

Bruce reigned fifteen years after Bannockburn and (if the Irish expedition of his brother Edward be left out of account) with almost uninterrupted success.

The wise provision that Bruce made for the regency secured the peaceful succession of his son David II. (1329-70), who was the first Scottish king anointed at his coronation—a privilege conceded to Bruce in a bull which reached Scotland after his death. According to the ideas of the age this placed the Scottish king on an equality with the sovereigns of Europe.

The almost contemporaneous reigns of David II. and Edward III. reversed the position of the two countries; Scotland had now one of its feeblest and England one of its most powerful kings. Had not the love of liberty become the life-blood of both nobles and commons in Scotland it must have succumbed in the desperate struggle. After the death of Robert, Randolph, earl of Moray, governed with wisdom and vigor for three years. On his death the estates chose Donald, earl of Mar, another nephew of Bruce, whom he had passed over, foreseeing his incapacity. Encouraged by the divisions of the nobles, Edward, son of John Baliol, with the barons who had lost their land by espousing the English side, suddenly landed at Kinghorn. Nine days after his election Mar was met and worsted by Baliol on Dupplin Muir (August 11, 1332), where Mar himself and many nobles were slain. Baliol was crowned at Scone; but Perth was immediately retaken, and Baliol, having been defeated at Annan by the young earl of Moray, left Scotland. Next year Edward came with a large army to his support and defeated at Halidon Hill (July 20, 1333), chiefly through the skill of the archers, the Scots led by Archibald Douglas, lord of Galloway, who was now regent. Berwick capitulated and Baliol surrendered it to England, pledging in addition the castles of the Lothians, including Edinburgh and Linlithgow, in security for an annual tribute of £2,000 ($10,000). Like his grandfather, Edward III. made a new ordinance for the government of Scotland, but his officers never obtained possession of their posts. Meantime David and his queen fled to France, where they remained seven years. Fortunately for Scotland a new race of patriotic leaders appeared; Moray of Bothwell handed down the traditions of Wallace and Bruce, while Robert the Steward, Douglas the knight of Liddesdale, and Sir Alexander Ramsay of Dalhousie sustained the fame of Bruce, Randolph, and Douglas. The attraction of a French campaign with the crown of France as prize prevented Edward from ever using his whole force against Scotland, and a French fleet made a diversion by attacking the Channel Islands and threatening the Isle of Wight. Edward retaliated by assuming the title of king of France, and after two years' preparation invaded that country from Flanders. The armies met at Vironfosse (September 26, 1339), where David of Scotland was present. Never was the pomp of chivalry seen in greater splendor, but the first act of the Hundred Year's War, which seemed destined to make French and English eternal enemies and French and Scots perpetual allies, passed without a blow.

Two years later the recovery of the Scottish castles and the repulse of Salisbury's attempt on Dunbar made it safe for David to return to Scotland, which Baliol had abandoned. Though scarcely eighteen, he assumed the government (March 30, 1342). Before his arrival Edinburgh had fallen, and next year Roxburgh was taken by Sir Alexander Ramsay, whom David unfortunately rewarded by the sheriffdom of Teviotdale, which the knight of Liddesdale claimed, and Ramsay, seized by treachery, was starved to death at the Hermitage by the knight of Liddesdale, who entered into correspondence with the English king, and dishonored his name of the "Flower of Chivalry." Bullock, an ecclesiastic, who had risen to the office of chamberlain under Baliol, and transferred his services to David, met the same fate at the hands of the king on a suspicion of treason. Other signs of weak government were not wanting. On the conclusion of a brief truce, David, tempted by Edward's absence, invaded England in spite of the defection of some of his chief nobles, and was defeated at Neville's Cross (October 17, 1346), near Durham, by the archbishop of York and the northern barons, the king and several of his nobles being taken prisoners. The rigor of David's captivity (which lasted eleven years) was relaxed so far as to allow him to return frequently to Scotland and try to persuade the people to raise his ransom, which the English king urgently required. Though Baliol was still acknowledged as nominal king by Edward, he resided in Galloway, while Robert the Steward, elected regent in the name of David, really governed. At length, by the treaty of Newcastle (July 13, 1354), David's ransom was agreed on, sufficient hostages being taken for its payment. Next year the French king resumed the Scottish war by by sending Eugène de Garancière with men, money and arms. Several border engagements followed, but Edward, advancing to the frontier, took Berwick, and obtained from his puppet, Baliol, an absolute surrender of the Scottish kingdom for an annuity. He ravaged the Lothians in the raid called the Burnt Candlemas, but failed really to reduce the country. Edward's victory over the French at Poitiers, in which many Scots were slain, forced the Scottish parliament to grant the terms dictated by the English king. Peace was finally concluded by the treaty of Berwick (October 3, 1357), and confirmed at Scone—the ransom being raised and the condition as to hostages made more severe. David at once returned to Scotland. He died on February 21, 1370, childless, and the succession opened to Robert, son of Bruce's daughter Marjory, the first of the Stuarts who were to govern Scotland for the next two centuries.

6. *House of Stuart from Robert II. to James IV.*—The descent of the house of Stuart is traced from Walter Fitz-Alan, a Norman, steward of David I. His estates were in Renfrew, to which Alexander, the fourth steward, added Bute by marriage. Walter, the sixth steward, was scarcely one of the chief nobles; but his prowess in the War of Independence gained him the hand of the daughter of Bruce. Robert II. was their only son.

Robert II. (1370-90), already fifty-four, continued rather than commenced his government on the death of David II., for he had been twice regent during David's exile and captivity. He did not ascend the throne without opposition, but the memory of Bruce was too fresh to admit of his settlement being put aside. The earl of Douglas, whose great estates on the border made him more formidable as a competitor than his claim by descent from a daughter of David, earl of Huntingdon, was conciliated by the marriage of the king's daughter Isabella to his son and by his own appointment as justiciar south of the Forth and warden of the eastern marches. This impediment removed, the coronation proceeded, and it was followed by a public declaration of the settlement of the crown on Robert's son John, earl of Carrick, at his father's death.

Robert III. (1390-1406)—for under that name the earl of Carrick was crowned to avoid the hated name of John—was even less active than his father. He is briefly but truly described by an historian as a good man but not a good king. He scarcely reigned, for the regency of his brother continued after his accession till it was succeeded for a few years by that of Robert's son, on whose death the earl of Fife again became regent. The last years of Robert were clouded by private and public misfortune. His queen, Annabella Drummond, his son-in-law, the earl of Douglas, and Trail, bishop of St. Andrew's, one of the wisest of his council, died within a short interval. The son of Douglas, though brave, was unequal to the task of holding the border against the Percies and the earl of March, and so constantly lost battles that he was called Archibald Tyneman. The Scots were signally defeated at Nisbet Muir (September 14, 1402), in Merse and at Homildon Hill near Wooler by Percy, where the slain and prisoners equaled the number at Otterburn. Nor could order be maintained within Scotland itself, of which the forcible marriage of the countess of Mar by Alexander, a bastard of the Wolf of Badenoch, was an example. Afraid of Albany, and warned by the fate of Rothesay, Robert sent his remaining son James to France (1405); but the ship in which he sailed was taken by an English cruiser, and the future king was a prisoner in England for nineteen years. This last blow broke the weak heart of Robert, who died at Dundonald and was buried at Paisley.

Though he was a captive, the right of James I. (1406-37) on his father's death was at once acknowledged by a general council held at Perth; but the appointment of Albany as governor boded ill for his return. He held the office thirteen years, administering it till his death so as to conciliate all classes and pave the way to his own accession to the throne, which would have been his by right had the young king died. In 1423 ambassadors sent by the Scottish parliament to England at last arranged terms for the return of James from his long exile (May 12, 1423).

He lost no time in addressing himself to the task of restoring the royal authority and the obedience to the law which the long regency had weakened. From this time dates the conflict between the king and the nobles. James for twelve years carried out, not without murmurs, but without successful opposition, his projects of reform.

During the fourteen years of his actual reign, James held thirteen parliaments, proving his desire to obtain the support of the nation in his reforms. The Scottish parliament continued to sit in one chamber of lords, clergy, and commons, and it was only in the reign of James V. that representation of the shires was admitted.

In 1434 the king applied the statute of his first parliament as to the resumption of lands to which no sufficient title could be shown. The estates of the earl of March were forfeited on the ground that Albany had exceeded his power in restoring them. He was created earl of Buchan with the intention no doubt of removing him from the border and conciliating him for his loss. The death in 1435 of Alexander Stuart, earl of Mar, led to the lapse of that earldom to the crown on account of his bastardy, and the following year the earldom of Strathearn was resumed on the ground that it was a male fee and did not pass to the wife of Patrick Graham, the heir-female. It was bestowed in life-rent on the king's uncle, the earl of Athole, and Malise, the son of Patrick Graham, was made earl of Menteith. This assertion of right on the part of the king to deal with the estates of the nobles, though fortified by legal documents and recognized possession, was certain to make enemies. It is more surprising that James so long succeeded in maintaining his authority than that he at last perished for doing so; but he had the people on his side. In the summer of 1436 he was obliged to relinquish the siege of Roxburgh owing to the barons' refusal of support. In October when the forfeiture of Strathearn was made in a parliament at Edinburgh, Sir Robert Graham, uncle and tutor of the young heir Malise, denounced the king in the boldest terms and urged the barons to seize his person; but, failing, he was banished from the court. As in other cases, this leniency was not requited. In his Highland retreat Graham formed a conspiracy with Athole, the king's uncle, who aimed at the crown, and Sir Robert Stuart, Athole's grandson. James was to spend Christmas at Perth. Before he crossed the Forth he was warned by an old Highland woman that if he passed he would never return. She tried unsuccessfully to get across to him again at the Dominican monastery at Perth, where he lodged. At midnight, when he was half undressed, Graham with 300 men surrounded the monastery. Their approach was heard; but it was found that the bolts had been removed by treachery. James was hastily concealed in a vault underneath the room. Before the conspirators entered a brave attempt was made by Catherine Douglas, one of the queen's maids, to bar the door with her arm, but the fragile obstacle broke and Graham burst in. The fall of another of the maids into the vault discovered the king, who fought fiercely for his life. The queen was wounded in trying to save him, fulfilling an unconscious prophecy of the *Kingis Quhair.* At last, after killing two of his assailants, he fell, overcome by numbers (February, 1437). Vengeance speedily overtook the murderers, who had made no provision to follow up their deed. Within a month they were all executed in a manner exceeding even the barbarous usages of the time. James was buried in the Carthusian monastery, where his doublet was long kept as a relic and seen by the people with veneration. Such was the sad fate of the best of the Stuarts—a king in advance of his age and too rapid in his reforms.

James II. (1437-60), an infant of six, called "Fiery-face" from a red stain on one cheek, was crowned at Holyrood five weeks after his father's death, and there commenced one of the long minorities which the early deaths of the Stuart kings made common, and during which history is chiefly occupied with the contest for the person of the king. The alternate struggles and reconciliations of these rivals continued till James was fourteen, when he favored Douglas (the eighth earl) in order to free himself from their control. This was a time of civil or rather private wars. The only contemporary chronicle marks almost every year with the seizure of a castle or a party fight. Douglas brought the earl of Crawford and his retainers from the Highlands, who ravaged the estates of the bishop of St. Andrews, and himself besieged Edinburgh castle. The castle surrendered; but Crichton, one of the adroit statesmen who rise after every fall, continued chancellor, and soon after, by negotiating the marriage of James with Mary of Guelders (1448), insured his favor with the court. Shortly after the celebration of this marriage Livingstone, now chamberlain, with many of his kindred and friends, was suddenly arrested and tried before a parliament at Edinburgh; two were executed, and the others, including the chamberlain, attainted and placed in strict ward in Dumbarton. Douglas and Crichton received part of the forfeited estates. James was chiefly advised at this period by Bishop Kennedy, whose counsel was the old one of "divide et impera." He now determined to do to the more powerful Douglas as he had done to the Livingstones. James felt a crisis had come and summoned Douglas to Stirling at Shrovetide. There the young king, in violation of hospitality and a safe conduct which he had given the earl, when Douglas refused to break the bond with the other earls, struck him with his knife and killed him (February 21, 1452). An appeal to arms necessarily followed. At length, after repeated struggles, Crawford was defeated at the Muir of Brechin and Douglas fled to England. His estates were of course forfeited. With England—one brief interruption excepted—peace had been preserved during the reign of Henry VI. Henry even agreed to restore Roxburgh and Berwick to Scotland in return for assistance against the duke of York. When Henry was taken prisoner at Northampton, his queen and her young son fled to Scotland, and James was called on to fulfill his engagements. He laid siege to Roxburgh, which for more than a century had defied his predecessors, and after a stout resistance it was taken; but James did not live to enjoy his triumph. When inspecting the discharge of a new gun it burst, and he was killed (August 3, 1460). He had not reached his thirtieth year.

On the Sunday after his father's death, James III. (1460–88) was crowned at Kelso. A regency was formed consisting of the queen, Kennedy, and others. A parliament followed at Edinburgh, which was blamed by the nobles for leaving so much power in the hands of a woman; but there was a full appointment to the offices of state, and, though Mary of Guelders aimed at more than the guardianship of her son, it does not appear that she really exercised royal authority.

Kennedy, who had the chief control of Scottish affairs, negotiated the release of Alexander, the king's brother, who had been taken by an English cruiser, and secured a truce between England and Scotland for fifteen years. He understood the nature of his countrymen better than any man, and was always ready to give counsel in parliament, while his learning, especially in the civil law, made him respected by foreign powers. When he died the country wept for him as for a parent.

Before his death a plot had been formed which threw the young king into different hands. Among the barons who received office at the commencement of the reign one of the foremost was Robert Boyd of Kilmarnock, the justiciar. Boyd determined to play the part of Livingstone in the last reign, and usurp the supreme power by seizing the person of the king.

The fall of Boyd, as sudden as his rise, whom with his brother Alexander James at first favored, was due to the same cause as that of Livingstone—the king's marriage and his desire when major to assert his independence.

The refusal of parliament in 1473 to sanction the proposed passage of James to France, to aid Louis XI. against Charles the Bold, on the score of the expense and risk, was the first indication of the difference between the king and the nobility which led to the disasters of the close of his reign.

In 1487 the greater part of the Scottish barons rose in arms. James had abandoned himself to another favorite, Sir John Ramsay, whose life had been spared at Lauder. The chiefs of the party were the earls of Angus and Argyll, Blackadder, bishop of Glasgow, and the Homes and Hepburns, powerful barons on the border. Having seized the person of the young prince, whom they already designated king, they pretended to act in his name. James retreated to Aberdeenshire, for the northern barons still adhered to him. Father and son, at the head of their respective forces, first met at Blackness (May, 1488), on the Forth, where a pacification was agreed to on terms which showed the king's party was the weaker. In the following month the rebellion was renewed and the king was slain at Sauchie (June 11th), within sight of Bannockburn. He was buried at Cambuskenneth, being only thirty-five years of age.

James IV. (1488–1513) was already sixteen when crowned at Scone. His reign is an interlude in the record of almost constant battles, murders, and executions with which Scottish history abounds. There were not wanting causes of offense between England and Scotland, but the politic Henry VII. avoided war and effected what previous kings had failed in the marriage between the royal houses. James, a popular monarch, succeeded better than any of his predecessors and successors in keeping on good terms with all classes. His court was one of splendor for a small country; indeed Scotland, almost for the first time, possessed a court which set the fashion of civilization and culture.

Henry VII.'s death (1509) changed the relations between Scotland and England. Henry VIII. had not liked his sister's marriage to the Scotch king and his refusal to deliver to her a legacy of jewels left by his father led to a coolness. The mutual attacks of English and Scottish privateers and border frays increased the bad feeling. Andrew Barton's ship the *Lion*, after an obstinate conflict, in which Barton was killed, was seized (1512) in the Downs by the sons of Howard, the English high admiral, and James' request for redress was met with the contemptuous answer that kings should not dispute as to the fate of pirates. But it was Henry's Continental policy which in the end provoked the war. The struggle in Italy between Louis XII. and Pope Julius II. gave him an opportunity, and he allied himself with the latter and invaded France. He attempted before leaving England to secure peace with Scotland by promising to redress its grievances. But James had renewed the old alliance with France, and the only answer given to the first embassy in 1512 was an offer to mediate between France and England. In 1513 the message was, that if Henry passed to France war would not be declared without a herald being sent. The French queen (Anne of Brittany) had given James a ring with a substantial subsidy, and he had already made up his mind for war. Like Henry, he longed to win his spurs. Henry went to France in June, and soon after his arrival at the camp at Térouanne, the Scottish Lord Lyons brought the threatened declaration of war (August 11, 1513). The grounds stated were the seizure of Scotsmen on the borders, the refusal of Margaret's legacy, and the death of Barton. No time was lost by James in carrying the declaration into effect; but the war was disliked by the nation. The earl of Arran, sent with the fleet to aid the French, sailed instead, in defiance of orders, to Carrickfergus. James himself called out the whole land force contrary to the advice of his counsel, mustering at the Boroughmuir 100,000 men according to English accounts—probably exaggerated, but doubtless as large an army as had been seen in Scotland. Crossing the border he took Norham, Wark, and Ford. At the last of these castles the wife of Heron, the proprietor, then a prisoner in Scotland, beguiled James by her beauty, causing him to waste several days and betraying his movements to the enemy. In the conduct of the battle (September 9, 1513) which followed he committed almost every fault a general could commit—neglecting to engage when the enemy were crossing the Till, allowing himself to be outflanked by Surrey, who got between him and the Scottish border, abandoning his strong position on the hill of Flodden, and finally exposing his own person on foot in the center of the fight. Some Scottish writers claim that the battle was a divided success and that the total number of English killed was greater; but Hall, an exact chronicler, says 12,000 Scots fell and only 1,500 English, as appeared from the book of wages when the soldiers were paid. What made Flodden so great a disaster was the quality of the Scottish loss. The king himself, his son, the archbishop of St. Andrews, two bishops, two abbots, twelve earls, and fourteen lords, besides many knights and gentlemen, were left on the field. There was scarcely a noble family which did not mourn some of its members. Surrey did not follow up his victory by invading Scotland, since his object was gained; the diversion by the Scots in favor of France was at an end. Scotland was again left with an infant king, scarcely more than a year old.

7. *The Reformation, its Antecedents and Consequences.*—James V. (1513–42), scarcely eighteen months old when he succeeded, was at once crowned at Scone, where a parliament met, chiefly attended by the clergy. The queen dowager was appointed regent—a secret message, however, being sent to John, duke of Albany, to come from France and assume the regency. He was succeeded by Lord Angus, who remained regent till the king assumed control.

James, only seventeen when he gained his independence (1528), showed, like other Stuarts, activity in government, and the fourteen years of his actual rule, while not marked by outstanding events, were a period of renewed order and prosperity. He first turned to the borders, where constant wars with England had bred a race of lawless freebooters. By the severity of his measures he succeeded in doing what Angus and his predecessors had in vain tried to do. The borders continued till the union to trouble the ministers of the law; but the clans who lived by plunder and blackmail were first really broken by the expedition of James V. But it was not only borderers who required to be taught that a king was again on the throne; Argyll, who had sought to make himself independent, was deprived of his lieutenancy and imprisoned; Bothwell, the father of Mary's husband, was beheaded for the favor he showed the borderers; and the estates of the earl of Crawford were forfeited. James made a progress through the Highlands and was sumptuously entertained by the earl of Athole. While criminal justice was strictly enforced, a step was at last taken to organize a central civil court (May 15, 1532), which had been a settled plan of the kings since James I. The College of Justice or Court of Session was founded in Edinburgh by the influence of Albany with the pope—funds being got from the bishops' revenues for the payment of the judges. Of the fifteen judges, eight, including the president, were to be clergy, and the barons were conciliated by the anomalous office of extraordinary lords.

The relations between James and Henry VIII. continued hostile and there were mutual raids till peace was concluded in 1534. War broke out again in 1540 and in 1542 the Scotch were totally defeated at Solway Moss. The news, brought to James at Caerlaverock, together with the disaffection of the nobles, broke his heart. A few weeks later at Falkland he heard of the birth of Mary Stuart, the daughter of his second marriage (with Mary, dowager duchess of Longueville, daughter of the duke of Guise), but the news brought him no comfort. His saying, "The crown came with a lass and will go with a lass," has passed into history, although the prophecy was not fulfilled. Outwardly his reign had been, with the exception of the closing scene, successful. He had restored order along the borders, and put down all attempts of the nobles against his person. He had maintained the church, supporting the bishops by severe laws against heresy. He had secured by his marriage the alliance of France and was on good terms with other Continental states. His powerful neighbor had not sudcceeed in wresting any land from Scotland. He was, like his father, a popular king mingling with the people in their sports, and respected because of his strict administration of justice. But his foreboding was not without cause. The power of the nobles had only been restrained, not destroyed. The aristocracy had too many heads to be cut off by one or several blows. The principles of the Reformation were gradually spreading in spite of the attempts to stifle them, and the infant to whom he left the crown had to encounter rebellion at home and the hostility of England, not less dangerous that she was heir to the English crown, and its rulers veiled their hatred of her by professions of friendship. Knox describes James as "a blinded and most vicious king." Buchanan, who knew him better, is more fair, ascribing his faults to his time and bad education and doing justice to the qualities which made him loved by the people.

Mary Stuart was deemed queen of Scotland from December 14, 1542, till July 29, 1567, when her son James VI. was crowned in her stead. This period of a quarter of a century is more crowded with events than any other part of the Scottish annals, except the War of Independence. It was the epoch of the Reformation, and it became a question of European as well as national importance which side Scotland would take. Closely connected with the religious question was the political, affecting the union of Scotland and England. The life of Mary, who united the personal charm of her race and its evil fortune, adds tragic interest to the national history. It falls into three parts—from her birth to her return from France as the young widow of Francis II. in 1561; from her arrival in Scotland till her flight in 1568; and from her arrival in England till her execution in 1587; but only the second of these enters into the direct current of Scottish history. During the first Scotland was under the regency, first of Arran, then of Mary of Guise. The death of James suggested to Henry a new scheme for the annexation of Scotland by the marriage of the infant heiress to his son Edward, and he released the nobles taken at Solway Moss on easy terms under an assurance that they would aid him. Sir Ralph Sadler, one of the ablest English residents at the Scottish court—half envoys, half spies—was sent to conduct the negotiations. Arran was tempted to favor the marriage by the offer of the princess Elizabeth for his son and the government north of the Forth. But the queen dowager, though she pretended not to be averse to it, and Beaton did all they could to counteract Henry's project. One part of it, the immediate delivery of Mary and the principal castles to the English king, was specially objected to. A mutual alliance between the two kingdoms was agreed to on July 1, 1543, and Mary was to be sent to England when ten years old. Soon after, the party of the nobles opposed to the match got possession of the young queen and removed her to Stirling. The English treaty was ratified by parliament; but Beaton and his partisans did not attend, and a few days later the regent, as Sadler expresses it, revolted to the cardinal. It was evident that the assured lords, though in English pay, were not to be relied on, and Henry resolved on war.

The death of Henry VIII. (1547) did not put a stop to the war with England. The protector Somerset proved to be an implacable enemy.

In the spring of 1554 the queen dowager succeeded in obtaining from Arran a surrender of the regency. Mary had now attained her twelfth year and a nomination by her of her mother as tutor gave the form of law to what was really the act of the queen dowager, the French king, and the nobility. The people acquiesced, for all classes were tired of a governor whose chief object was money. The new regent applied herself at once to the perennial work of every Scottish Government, the repression of disorder in the Highlands, and first Huntly, afterward Argyll and Athole, were sent to Argyll and the Isles; but the presence of royalty was, as had before been found, the best remedy, and she made next year a circuit in person with more success than any of her lieutenants. Under the advice of her French counselors she now garrisoned Dunbar with French soldiers and built a fort at Eyemouth (1556). She even ventured to propose to levy a tax for the maintenance of a standing army; but the remonstrance of 300 barons, headed by Sir John Sandilands, forced her to abandon a project so fatal in that age to liberty. Next year, at the instigation of the French king, she endeavored to force the country into an English war. No time could have been worse chosen, for commissioners from England and Scotland had actually met at Carlisle to adjust differences between the two countries. The Scottish barons refused to fight, and from that date, Bishop Lesley notes, the queen regent could never agree with the nobility, and sundry of them sought by all means to raise sedition against her and the French.

In the parliament at the close of the year commissioners were appointed to go to France for the marriage between Mary and the dauphin. Their instructions were to obtain a promise from both to observe the liberties and privileges of Scotland and its laws, and a ratification of the Act passed in 1548, when it was first proposed to send the young queen to France. The contract of marriage provided that their eldest son was to be king of France and Scotland, and the eldest daughter (should there be no son) queen of Scotland, to be given in marriage by the joint consent of the king of France and the Scottish estates. In the event of her husband's death Mary was to be free to stay in France or return to Scotland. The marriage was solemnized at Notre Dame on July 24, 1558. But prior to the public contract a secret arrangement had been made, by which Mary, in three several deeds, made over the kingdom of Scotland to the king of France and his heirs if she died childless, assigned to him possession of the kingdom until he was reimbursed in a million pieces of gold for her entertainment in France, and declared that, whatever documents she might afterward sign by decree of parliament, this arrangement expressed her genuine intention. After the return of the commissioners the crown matrimonial, with the title of king, was granted by parliament to the dauphin.

While statesmen were occupied with the queen's marriage the Reformation had been steadily advancing. Knox labored incessantly, preaching in Edinburgh ten days in succession and making rapid visits to the central and western shires. He attracted to his side representatives of nobility and gentry, and had much support in the towns. The earl of Glencairn, Lord Lorne, Lord James Stuart, the future regent, and the laird of Dun, John Erskine, in Angus were among his earliest followers, as well as many of the tradesmen and artisans. Knox now openly denounced attendance at mass as idolatrous and began to administer the Lord's Supper after the manner of the Swiss Reformers. He was summoned to Edinburgh on a charge of heresy; but, though he kept the day, the proceedings were dropped. Shortly after he was again summoned, but meanwhile had accepted a call from Geneva. In his absence he was condemned for heresy and burned in effigy at the market cross of Edinburgh. The time of compromise, if compromise had ever been practicable between Rome and Geneva, to which the Scottish Reformers adhered, was now past. Two events had occurred which hastened the crisis. On November 17, 1558, the death of Mary Tudor once more placed on the English throne a sovereign inclined to favor the Reformation. In May Knox returned to Scotland and the Scottish Reformers once more had a determined leader. For particulars of the ensuing struggle see PRESBYTERIANISM.

The death of Francis II. (December 6, 1560) materially altered the political situation. The much feared subordination of Scotland to France was at last averted. Mary Stuart, only nineteen, was young enough to be influenced by a new husband and new responsibilities. Her character was not yet known, but her relations with Catherine de' Medici were not friendly, and there was little doubt that she would take advantage of the provision in her marriage articles and return to Scotland.

On her return to Scotland Mary showed herself disposed to conciliate the Reformers provided she was allowed the exercise of her own faith. This had been guaranteed her by Lord James. His near kinship to the queen at a time when the stain of bastardy was less regarded, and his close relation with the Reformers, made him necessary to both and gave him an influence which his eminent prudence used for the good of the nation, but with an eye to his own advantage. Without thrusting himself too prominently forward, he led the privy council (ably supported by Lethington), and, without the name, was in fact prime minister. The title of Mar, and, when that was reclaimed by the heir of the Erskines, of Moray or MURRAY (*q.v.*), with its large territories, gave him the designation by which he is best known, as well as great wealth, which he dispersed by means not well explained. But the leaven of another influence than that of the statesman was now at work in Scottish politics. This was embodied in John Knox, the most representative Scotsman since Wallace.

Not only to Knox and the Reformers, but to all classes the question of the day was the queen's marriage. Apart from her beauty, her political position rendered her hand of importance to the balance of power. It held not only the dowry of France and the possession of Scotland, but a claim, which might be at any moment asserted, to the English crown. She avowed her inclination to marry, and, indeed, she required a man to put her in possession of her kingdom. Don Carlos, the archduke of Austria, son of Philip of Spain, Charles IX. of France, the kings of Denmark and of Sweden, the archduke Charles, second son of the emperor, were all passed in review but rejected. Elizabeth pressed the claim of her favorite Leicester—a project supported by Cecil and Moray. In the end the fair face and fine figure of her young cousin Henry Stuart, Lord Darnley, carried the day. A party of the Scottish nobles—Athole, himself a Stuart, Morton, Crawford, Eglinton, and Cassilis—favored the alliance. David Rizzio, the queen's foreign secretary, who already had great influence with her, promoted it. But it was her own act, the most dangerous of many false steps in her life. Shortly before the marriage (July 29, 1565) Moray attempted to seize Darnley and the queen as they rode from Perth to Callendar near Falkirk. When it was accomplished he rose in arms with the duke of Chastelherault, the head of the Hamiltons, Argyll and Rothes; but Mary with a large force pursued them from place to place in the Roundabout Raid, from the neighborhood of Edinburgh through Fife, where she levied fines, and finally to Dumfries, from which Moray fled to England. He had been secretly but not vigorously supported by Elizabeth, who, when she heard of his flight, recalled her orders to Bedford, then on the marches to place troops at the disposal of the insurgents. Mary still retained some of the popularity of a young queen, and fostered it by an apparent desire to humor the Reformers. For the first time she attended a Protestant sermon. But the consequences of a union between a high-spirited woman, active in mind and body beyond her sex and years, with a vain and dissolute youth were soon seen. His alienation from the queen, the murder of Rizzio, with the intrigues that preceded and followed it, the rapid growth of Bothwell's influence, the pitiable vacillations of Darnley, and his murder at Kirk of Field (February 10, 1567) have been sketched in the article MARY.

The strange wooing which commenced when Darnley was just buried, if not before, was continued by the seizure of Mary by Bothwell near Cramond and her captivity in her own castle of Dunbar—a pretense according to her adversaries, an opportunity for an outrage from which marriage was the only escape according to her defenders—at last culminated in the marriage at six in the morning, at Holyrood, on May 15, 1567.

The leading nobles were not disposed to accept a new master in Bothwell, whose vices, unlike those of Darnley, were coupled with a strong instead of a weak character. They kept jealous possession of the young prince, placed in the custody of Mar in Stirling; and, when a muster was called to enforce order on the border, secretly collected their forces to act against instead of for the queen and her husband. Within a month of her marriage she was met at Carberry Hill, near Musselburgh (June 15, 1567), by a force of the confederate lords, headed by Morton and Glencairn, Ruthven and Lindsay. Mary, after a fruitless attempt at mediation by Du Croc, the French ambassador, and an offer equally vain by Bothwell to decide the issue by single combat, surrendered to Kirkaldy. Bothwell rode off to Dunbar with a few followers, and Mary was conducted to Morton's camp. Once in their hands, the lords treated her as a prisoner, and confined her at Lochleven Castle, where she was forced to abdicate, surrendering the crown in favor of her son and committing the regency during the minority to Moray. The young king was crowned at Stirlingon July 29th. The prudent Moray, who had kept out of the way in France while these events were transacted in Scotland, now returned and was installed as regent (August 22d). Mary remained prisoner in Loch Leven for nearly a year. After her escape on May 2, 1568, the duke of Chastelherault and other Catholic nobles rallied around her standard; but on May 13th, Moray and the Protestant lords met her forces at Langside near Glasgow, and the issue of that battle forced her to fly to England, where she placed herself (May 19th) in the hands of Lord Lowther, governor of Carlisle, recalling Elizabeth's promises of protection. Mary, however, found that she was really a prisoner. Like Baliol, she disappears personally from the field of Scottish history, but her life in exile, unlike his, was spent in busy plots to recover her lost throne. It became clear as the time went on that she placed her whole reliance on the Catholic minority and foreign aid; even in prison she was a menace to Elizabeth and ready to plot against her as an enemy. The Protestant party increased in Scotland until it became a majority almost representative of the whole nation; even her own son when he came to hold the scepter, little inclined as he was to accept Presbyterian principles, regarded her as a revolutionary element fortunately removed. Her knowledge of Babington's plot for the invasion of England is proved, though her assent to the death of Elizabeth is still an open question. By her will, confirmed by her last letters, she bequeathed the crown of Scotland and her claim to that of England to Philip II. The letters contain this modification only, that her son was to have an opportunity of embracing the Catholic faith under the guardianship of Philip to save his own throne. There was no such reservation as regards that of England. The Armada, from whose overthrow date the fall of Spain and the rise of Britain as the chief European power, was due to the direct instigation of Mary Stuart.

Meantime, in Scotland, four regencies rapidly succeeded each other during the minority of James. The deaths by violence of two regents, Moray and Lennox, the suspicion of foul play in the death of the third, Mar, and the end scarcely less violent because preceded by a trial of the fourth, Morton, mark a revolutionary period and the impossibility of the attempted solution by placing the government in the hands of the most powerful noble. The religious struggle still went on with unabated vigor and the time had arrived when the Scotch king must choose between Romanism and Presbyterianism.

Meantime a series of intrigues went on between the English and Scotch courts. Elizabeth, while ostensibly favoring the exiles who had been driven from Scotland during the factious warfare of the different regencies, disliked their political principles. James and Arran, instead of leaning on the papacy as Mary did, had shown signs of accepting a solution of the problem of church government more like that of England than of Geneva. There was here ground for a compromise of the religious controversy which political reasons made so desirable. Accordingly Lord Hunsdon, a favorite courtier of Elizabeth, met Arran near Berwick in the autumn, when it was arranged that the master of Gray, then a follower of Arran and personal favorite of James, should go to London in October. At his instance Elizabeth removed the banished Scottish lords and ministers from Newcastle to London. But Gray was playing his own game, and his suggestions that these lords might return to Scotland, and that the alliance with England should be carried out by their aid and his own influence independently of Arran, were taken up by the queen, who had no personal liking for Arran, and ultimately effected. Elizabeth sent Wotton to Scotland, who won the confidence of James, to whom he promised a pension of £5,000 ($25,000) a year, and while openly negotiating with Arran secretly plotted with Gray for his downfall. A mutual league between England and Scotland against the Catholics, called "the Bond anent the True Religion," was agreed to by a convention of estates in July, 1585.

This was a turning-point in the life of James and in the history of Scotland. The choice was made between France and England, Romanism and Protestantism. It was not likely to be reversed when with Elizabeth's declining years the crown of England was thrown into the balance. The day before the conclusion of the treaty Arran was, at the request of Elizabeth's envoy, put in strict ward, under the pretext that he had been privy to the death of Lord Russell, son of the earl of Bedford, in a border fray, and he only escaped at the price of his estates and honors. In November the banished lords—Angus, Mar, the master of Glamis—

returned, and along with them the two Hamiltons; and, aided by Gray, they seized the person of the king and the castle of Stirling, and assumed the government. The alliance with England was finally ratified at Berwick by Randolph. James, at the instigation of Gray, wrote a harsh letter to his mother; and at the instance of Elizabeth he allowed George Douglas, who had been concerned in Darnley's murder, to return to Scotland. The exiled Protestant ministers were restored to their livings; but James was resolute in maintaining Episcopacy and enforcing the laws against all who denied the royal supremacy. Adamson was indeed forced by a general assembly to disclaim any authority as archbishop not allowed by God's Word, and an Act was passed again dividing Scotland into presbyteries, but the king refused to subject the bishops to their jurisdiction. Mary, deserted by her son, now allowed herself through her immediate confidants, especially her secretaries Nau and Curle, to take an active though secret part in the Jesuit plots which embraced both Scotland and England in their ramifications. That which had for its aim the assassination of Elizabeth was discovered by Walsingham's spies, and though forgery was resorted to, it is difficult to doubt that Mary was cognizant of the design. The trial at Fotheringay could have but one result under a statute according to which any attempt against the queen's life was treason in the person for whom it was made as well as in the actual perpetrators. The execution (February 8, 1587) of Mary naturally roused the anger of the Catholic powers and some indignation in Scotland, which James professed to share; yet he did nothing but expostulate. In truth his own crown was threatened by the same enemies. Mary had disinherited him in favor of Philip of Spain, unless he adopted the Catholic faith. The defeat of the Spanish Armada by the sovereign and people of both countries was felt to be a providential deliverance. Nothing could have served better to efface the memory of Mary and extinguish pity for her fate. The fall of Gray, who was tried and condemned for treachery during his English embassy and for correspondence with Catholic princes, left James, now of full age.

Projects for the king's marriage had been on foot at an earlier period; but at last the choice fell upon Anne of Denmark. Elizabeth opposed the match; but James, perhaps tempted by the offer to surrender the Danish claim to Orkney and Shetland, perhaps also not unwilling to show he could choose for himself, was married to Anne by proxy. Anne set sail for Scotland, but was driven back by a storm. Accordingly James himself went to claim his bride, when the actual marriage was at once celebrated at Copenhagen, where he spent the winter. It was a political advantage both to the king and to Scotland to form a connection with a kingdom which, though small, stood comparatively high at that time in Europe, and was completely independent both of England and of France. After the king's return the Presbyterian party was in the ascendant. In 1592 parliament, led according to James Melville by Maitland, now Lord Thirlestane and chancellor, reëstablished Presbyterian church government.

From the king's majority to his accession to the English throne, his relations to the nobles on the one hand and to the Presbyterian party led by the ministers on the other require to be kept in view as giving the key to a singularly confused and changing course of events.

In October, with the consent of the convention of estates, he appointed three bishops to vacant sees, and they sat in parliament, though as yet without any place in the government of the church, which was still Presbyterian, and with no sanction of course from the assembly or the ministers. James had to assume the English crown before Episcopacy could really be restored. This crisis of his career was not long delayed. Already Elizabeth's death was being calculated on, and her courtiers from Cecil downward were contending for the favor of her heir. She died on March 24, 1603, and James was at once proclaimed her successor in accordance with her own declaration that no minor person should ascend her throne but her cousin the king of Scots. Leaving Edinburgh on April 5th, James reached London on May 6th, being everywhere received with acclamation by the people. Thus peacefully at a memorable epoch in the history of Europe was accomplished the union of South and North Britain. Often attempted in vain by conquest, it was now attained in a manner soothing the pride of the smaller country, without at first exciting the jealousy of the larger, whose interest was, as Henry VII. prophesied, sure to predominate. To James it was a welcome change from nobles who had threatened his liberty and life, and from ministers who withstood his will and showed little respect for his person or office, to the courtier statesmen of England trained by the Tudors to reverence the monarch as all but absolute, and a clergy bound to recognize him as their head. To Scotland, a poor country, and its inhabitants, poor also but enterprising and eager for new careers, it opened prospects of national prosperity which, though not at once, were ultimately realized. It was an immediate gain that border wars and English and French intrigues were at an end. This more than counterbalanced the loss of the court, a loss which probably favored the independent development of the nation. For the present no change was made in its constitution, its church, or its laws. The Reformation had continued the work of the War of Independence. Scotland no longer consisted only of the prelates, the nobles, and the landed gentry. The commons, imperfectly represented in parliament by the burghs, not yet wealthy enough to be powerful, had found a voice in the assemblies of the church and leaders in its ministers and elders.

James during the first half of his reign as sovereign of Great Britain allowed himself to be mainly guided by Robert Cecil, Lord Salisbury, the son of Burghley, an hereditary statesman of great ability as an administrator. But on two subjects closely connected with Scotland the king had decided opinions of his own. He desired to see Scotland bound to England, not merely by the union of the crowns, but by a union of the parliaments and laws, and if not an immediate an ultimate union of the churches. He was equally determined that the church in both countries should combine a moderate Protestant doctrine—a *via media* between Rome and Geneva—with Episcopal government. Both desires were founded on prudent policy and might possibly have been accomplished by a stronger and wiser monarch.

After the death of Cecil James gave way to that influence of favorites to which he had shown himself prone in his younger years; but in the affairs of Scotland, which produced much trouble and little profit, Somerset and Buckingham took no interest and James was his own master. After an absence of fourteen years he visited his native country. He had promised to return every three years, but the business and pleasure of the English court detained him. His main object was to carry out still further the uniformity of the church, in which the bishops had not succeeded in establishing the same service as in England. This object was apparently attained in 1618 by the adoption of the Five Articles of Perth, but at the cost of sowing the seed of religious war. From this time to James' death little occurred worthy of note in the history of Scotland. On March

22, 1625, James died, leaving to his son Charles a burden of government heavier than when he had himself undertaken it. His apparent succcess in carrying to a further point the absolute and arbitrary principles of the Tudor sovereigns scarcely concealed the real failure. Ireland, with difficulty kept down, was not really subdued. The parliament of England had given unmistakable signs that it was only waiting an opportunity to restore the constitution on the old basis. The religious and political instincts of the Scottish nation, suppressed by force, were gathering strength to reassert themselves if necessary by revolutionary methods. An exhausted exchequer, which James had attempted to fill by monopolies, and by the sale of offices and honors and so-called benevolences, added to the other difficulties of carrying on the government, but was fortunately, as in the time of the Plantagenets, to afford the occasion for maintaining the constitutional struggle.

8. *Period of Civil Wars, Charles I. to Revolution.*—Eight years after his accession Charles I. visited Scotland (1633). During these he had pursued his father's policy. No Scottish parliament sat, though a nominal one was adjourned annually between 1628 and 1633. No general assembly met, but the restoration of Episcopacy and the uniformity of the churches were steadily prosecuted by royal influence and the exercise of the royal prerogative. In spite of the opposition of a convention of the estates, which nearly ended in bloodshed, the king carried out the resumption of tithes for the benefit of the clergy from their lay impropriators. The revocation in 1625 of all grants in prejudice of the crown, whether before or after the Act of Annexation of 1587, was superseded by a new measure, ratified by parliament in 1633, declaring the terms on which the tithes might still be acquired and valued by the heritors. Few measures have been of greater importance in their bearing on Scottish history. The revocation alienated the nobles and landed gentry, who dreaded that when so much had been, still more might be, taken from their profits in the Reformation. The new valuation left the parochial clergy in the position of a poor class, with interests antagonistic to the gentry, whose income was diminished whenever the ministers attempted to raise their scanty stipends. The question of a liturgy was not allowed to rest. It was brought before the Scottish bishops in 1629; their draft was submitted to Laud, who, detecting in it Low Church doctrine as to baptism and traces of Knox's *Book of Common Order*, refused his approval and advocated the introduction of the English Prayer Book, by which uniformity would be secured.

At last, on Sunday, July 23, 1637, the much-dreaded liturgy, the use of which had been enjoined by the *Canons* and announced on the preceding Sunday, was introduced in the service of St. Giles Cathedral, Edinburgh. For the most part a transcript of the English Prayer Book, it deviated slightly in the direction of the Roman ritual. Its use provoked an uproar, of which the stool flung at the dean by a woman, Jenny Geddes or Anne Mein, was the symbol, and brought the service to a close—Lindsay, the bishop, being with difficulty saved from the violence of the mob. A similar riot took place in Greyfriars church, where the bishop of Argyll attempted to use the book. There had been no such tumult since the Reformation. The Covenant, prepared by Alexander Henderson, leader of the ministers, and Johnston of Warriston, was revised by Rothes, Loudon, and Balmerino, and accepted by upward of two hundred ministers who had gathered in Edinburgh. It was signed at Greyfriars church, March 1, 1638, first by many of the nobles and gentry, then by three hundred ministers and a great multitude of the people. Copies were at once dispatched throughout the country, and with few exceptions, chiefly in St. Andrews and Aberdeen, it was accepted by all ranks and classes. Its form was suggested by the bonds for material aid of which Mary's reign had given so many examples, but the new name pointed to a Biblical origin, and the parties were not the nobles and their retainers, but God and His people. While nominally professing respect for the royal office, it was entered into, as it anxiously reiterated, for "the defense of the true religion (as reformed from Popery) and the liberties and laws of the kingdom." The spirit in which it was signed was that of a religious revival. Many subscribed with tears on their cheeks, and it was commonly reported that some signed with their blood. Charles could not relish a movement which opposed his deepest convictions as to church government and under the form of respect repudiated his supremacy; but, destitute of power to coerce the Covenanters, he was compelled to temporize. Hamilton as his commissioner offered to withdraw the service book and *Book of Canons*, to give up the Court of High Commission, and to allow the Articles of Perth to remain in abeyance. A new confession, called the "negative," framed on that of 1580, and a new covenant called the "king's," on the model of one drawn in 1590, which bound the signers only to stand by the king in suppressing Papists and promoting the true religion, were devised, but failed to satisfy even the least zealous Covenanters.

An assembly at last met in Glasgow, over which Hamilton presided, with faint hope that matters might still be accommodated. Hamilton had orders to dissolve it if it proved to be intractable. In spite of the commissioner's attempt to raise the question of the validity of elections, the assembly declared itself duly constituted. Discussion was useless between a commissioner and an assembly whose power to act he denied. He accordingly dissolved it in the name of the king and left Glasgow; but this only stimulated its members. It annulled the pretended assemblies between 1606 and 1628, condemned the service-book, *Book of Canons*, *Book of Ordinances*, and the High Commission Court, deposed the bishops on separate libels which set forth various acts of immorality or crime, many of which were false, declared Episcopacy to have been abjured in 1580, and condemned the Five Articles of Perth. It concluded its month's labors by restoring Presbyterian church government.

The distance from such an assembly to the field of arms was short, and on June 7, 1639, the army of the Covenanters under Alexander Leslie, a general trained in the service of Gustavus Adolphus, met the royal troops led by the king at Dunse Law. Charles, though slightly superior in numbers, had an undisciplined army and no money to maintain it, while Leslie had trained officers and troops animated by religious zeal. Councils of war, as well as religious meetings, were held daily, and the militant fervor of the Covenanting troops steadily rose. Charles declined to engage such an army and general, and by the Pacification of Berwick (June 18th) both parties agreed to disband, and Charles to issue a declaration that all ecclesiastical matters should be regulated by assemblies, and all civil by parliament and other legal courts. On August 1st a free general assembly was to be held at Edinburgh, and on the 20th a free parliament in which an Act of Oblivion was to be passed. The assembly met as appointed, and, without explicitly conforming, reënacted the principal resolutions of that of Glasgow, and declared that the Covenant should be subscribed by every one in office and authority. Before it separated it condemned the *Large Declaration*, a pamphlet by Balcanquhal, dean of Durham, published in the king's name, which gave an adverse narrative of recent events in Scotland. The parliament effected little legislation, but showed its disposition by abolishing Episcopacy and reforming the election of the Lords of the Articles, of whom eight were henceforth to be chosen by the nobles, lesser barons, and burghs respectively. The predominance of the king and the church was thus removed from the body which initiated all legislation.

The progress of the Civil War belongs to English history. Here only the part taken by the Scots can be stated. They were now courted by king and parliament alike. The campaign of 1642–43 under Essex proved indecisive, and the Parliament sent commissioners headed by Sir Henry Vane to Edinburgh in the autumn of 1643, who agreed to the "Solemn League and Covenant," already accepted by the Scottish assembly and parliament, and now ratified by the English parliament and the assembly of divines at Westminster. This memorable document, whose name showed its descent from the National Covenant, bound the parties to it "to preserve the Reformed Church in Scotland and effect the reformation of that in England and Ireland in doctrine, worship, discipline and government according to the Word of God and the example of the best Reformed Churches." But the alliance with the Scottish Covenanters did not produce the advantage expected from it. The victory of Marston Moor was due to Cromwell and his Ironsides, who were Puritans and Independents. The Scots, who formed the center of the parliamentary army, were repulsed. In the autumn, although the Scots took Newcastle, the king gained ground in the west, where Essex, the general who represented the Presbyterians, narrowly escaped capture. Next year Montrose, in the brilliant campaign on which his military fame rests, made a formidable diversion in the Highlands. With dazzling rapidity, at first supported only by a handful of followers, but gathering numbers with success, he erected the royal standard in Dumfries; then, passing to the Highlands, after the victory of Tippermuir, he took Perth, and defeated Lord Lewis Gordon at the Bridge of Dee. Next, after ravaging the county of Argyll, he marched to Inverness, but returned to defeat Argyll at Inverlochy, won further victories at Auldearn near Nairn and Alford on the Don, and by that of Kilsyth appeared to have recovered Scotland for Charles. The fruit of all these victories was lost by his defeat at Philiphaugh (September 13, 1644) by Leslie. Meantime Charles had lost the battle of Naseby, and next year was forced to take refuge at Newark with Leslie, whom he had created earl of Leven. As the result of his surrender he ordered Montrose, who was again raising the Royalists in the Highlands, to lay down his arms; and the Scottish army in England, no longer on good terms with the parliament, returned to Newcastle, that, being nearer home, it might dictate the terms of its services. Here it remained eight months, during which a strenuous attempt was made to force Charles to accept the Covenant. Alexander Henderson argued the matter with him in a singularly temperate correspondence. But the king was bound to Episcopacy by hereditary sentiment and personal conviction. Another negotiation was going on at the same time between the Scottish army and the English Parliament for arrears of pay. On January 30, 1646, they surrendered the king to the English commissioners, the question of pay having been settled by the receipt of £200,000 (about $1,000,000) a few days before and a like sum a few days after that date. There was no express condition which bound the two circumstances together, but their concurrence cannot have been accidental.

In his captivity Charles renewed his negotiations with the Scottish estates, over which Hamilton had now acquired influence, and a compromise was at last agreed to at Newport, in the Isle of Wight, by which he promised to confirm the League and Covenant by act of parliament, to establish Presbyterianism and the Westminster Confession, which as well as the Directory had been adopted by the Scottish parliament for three years. After that period it was to be fixed by the king and parliament what form of church government was most agreeable to the word of God, and this after consultation with the assembly was to be established. The Scots consented that in the meantime the Covenant should not be enforced on those who had conscientious scruples, and that the king might continue to use the English service. The Covenanters who accepted these terms, and who formed the most moderate section, received the name of Engagers. Relying on the promised support from Scotland, Charles rejected the proposals of the English parliament. That body had now broken with the army, in which the Independents and Cromwell were fast acquiring supremacy. Their division afforded an opportunity for renewing war, and Hamilton invaded England in the following year, but was routed at Preston (August 17, 1648) by Cromwell.

The death of Charles altered in a moment the relations between England and Scotland. In the former Cromwell became all powerful, while in the latter the moderate Presbyterians attached to the principle of monarchy and the hereditary line at once proclaimed Charles II. Charles II. had been brought up with different views of royalty from those of the Covenanters, and Scotland was not prepared to accept a king except on its own terms. A commission from the estates and from the assembly was at once sent (March, 1649) to The Hague, where the young king was. Charles promised to maintain the government of Scotland in church and state as settled by law, and particularly the Covenant, Confession of Faith, and Presbyterian system, but declared that he could not impose the Solemn League and Covenant on England and Ireland without the consent of their parliaments. The commissioners returned dissatisfied with this answer and with the presence at court of Montrose, by whom it had probably been framed. But in October Ormonde's Irish expedition failed, and Cromwell, already master of England, had reduced Ireland by force of arms; both parties felt inclined to renew the treaty. At length it was agreed that Charles should be accepted as king on condition of his subscribing the Covenant, establishing Presbyterian church government and worship, sanctioning the acts of parliament passed in his absence, and putting in force the laws against Catholics. In return he stipulated for the free exercise of his royal authority, the security of his person, and the aid of a Scottish army. The treaty was closed on these terms on May 9, 1650, and early in June Charles set sail for Scotland.

Under the protectorate the internal condition of Scotland was much improved. It was a maxim of Cromwell's policy to improve the condition of the commons, and in one of his last speeches he claimed in memorable words to have effected this in Scotland. In this respect the Commonwealth and protectorate continued the political effect of the Reformation. The commonalty, for the first time since the War of Independence, acquired a consciousness of its existence and hope for the future. Cromwell, like former powerful rulers, aimed at uniting Scotland with England, but his proposals in this direction were premature. To Barebones' Parliament (1653), which met after the dissolution of the Long Parliament, five Scottish members were summoned, there being 134 from England, Wales, and Ireland. By the Instrument of Government and an ordinance following on it, Scotland was granted 30, while England had 400 members; but only 20 Scottish members attended the parliament of 1654, and care was taken by Monk that they should be men attached to Cromwell's interest. When in his second parliament in 1656 he tried the experiment of a House of Lords, three Scotsmen were summoned, the quota of members to the Commons remaining as before. Cromwell's idea of a parliament was an assembly to ratify, not to discuss, his measures, and this, like his other parliaments, was speedily dissolved. Had it continued the Scottish representatives would have had little weight. Scotland continued to be governed by the council of state. On the death of the Protector his son Richard was proclaimed his successor in Scotland as well as in England, and thirty members were again returned to the new parliament, which, however, was almost immediately afterward dissolved. The Restoration soon followed, though in Scotland there was no need of it, for Charles II. was already king. However beneficial the rule of Cromwell may be deemed, it had a fatal defect in the eyes of a people proud of their freedom. It was imposed and maintained by force. His death and the restoration of the ancient line of kings were looked on as a deliverance from oppression.

The hopes of the Scots from Charles II. were doomed to speedy disappointment. So far from being grateful for the support they had given him in adversity, he looked back with disgust, as his grandfather had done, on the time when he was under the yoke of the Presbyterian ministers. In August, Lauderdale, who acted as secretary for Scotland in London, wrote to the privy council announcing the royal intention to restore Episcopacy, and, regardless of his oath, Charles sanctioned this by the first Act of the parliament of 1662.

A change in its rulers brought no relief to Scotland. The declaration that the Covenants were illegal oaths was reënacted and imposed on all persons in office who had not yet taken it. The old mode of electing the Lords of the Articles, which placed the election in the hands of the bishops, the nominees of the king, was restored.

It appears to have been the design of Lauderdale, who still governed Scotland absolutely through the privy council (no parliament having been summoned since 1674), to force the Scots to rebel. "When I was once saying to him," relates Burnet, "'Was that a time to drive them into a rebellion?' 'Yes,' said he, 'would to God they would rebel that he might bring over an army of Irish Papists to cut their throats.'" One part of his wish was speedily fulfilled. In 1679 the rebellion so long smoldering broke out. The murder of Sharp (May 3d) by Hackston of Rathillet and a small band of Covenanters was followed by a still more stringent proclamation against field conventicles, which were declared treasonable, and the possession of arms was prohibited. This severity provoked a rising in the west.

The duke of York, who had become a Roman Catholic during his residence abroad, was now sent to Scotland, partly to avoid the discussion raised by his conversion as to his exclusion from the succession. During a short stay of three months he astonished the Scots by the mildness of his administration, but on his return in the following year he revealed his true character. Torture was freely resorted to by the privy council and the duke himself took pleasure in witnessing it. A parliament summoned in 1681, after passing a general Act against Popery to lull suspicion, proceeded to declare the succession to be in the ordinary line of blood and unalterable on account of difference of religion by any future law. The Test Act was then carried, not without many attempts to modify it. The conduct of the government in Scotland gained for this period the name of the "Killing Times."

The short reign of James VII. [James II.] is the saddest period in the history of Scotland. He succeeded in the brief space of three years in fanning the revolutionary elements in both England and Scotland into a flame which he was powerless to quench. He declined to take the Scottish coronation oath, which contained a declaration in favor of the church then established. A submissive parliament held (April 28, 1685) under the duke of Queensberry as commissioner not only overlooked this but expressed its loyalty in terms acknowledging the king's absolute supremacy. The excise was granted to the crown forever and the land tax to James for life. The law against conventicles was even extended to those held in houses, if five persons besides the family attended domestic worship; while, if the meeting was outside the house, at the door or windows, it was to be deemed a field conventicle, punishable by death. The class of persons subject to the test was enlarged.

Meantime the rapid series of events which led to the Revolution in England had reached its climax in the trial and acquittal of the seven bishops. William of Orange, who had long watched the progress of his father-in-law's tyranny, saw that the moment had come when almost all classes in England as well as Scotland would welcome him as a deliverer. But the Revolution was differently received in each part of the United Kingdom. In England there was practically no opposition; in Catholic Ireland it was established by force. Scotland was divided. The Catholics, chiefly in the Highlands, and the Episcopalians led by their bishops, adhered to James and formed the Jacobite party, which kept up for half a century a struggle for the principle of legitimacy. The Presbyterians—probably the most numerous, certainly the most powerful party, especially in the Lowlands and burghs—supported the new settlement, which for the first time gave Scotland a constitutional or limited monarchy.

Meantime the convention parliament in Edinburgh had carried the necessary measures for the transfer of the government of Scotland to William and Mary. It declared in bolder terms than the English parliament that James had forfeited the crown and that the throne was vacant. The fifteen articles which contained the reasons for this resolution were included in a Declaration and Claim of Right—a parallel to the English Declaration and Bill of Rights. As a conclusion the estates resolved that William and Mary should be declared king and queen of Scotland during their lives, but with the right of exercising regal power in William alone as long as he lived. After their death the crown was to pass to the heirs of the queen's body, and failing her to Anne of Denmark and her heirs, failing whom to the heirs of William. Commissioners were dispatched to London to present the declaration and statement of grievances and take the royal oath to the acceptance of the crown on their terms. This was done at Whitehall, in the following March (1689); but William, before taking the oath, required an assurance that persecution for religious opinion was not intended and made a declaration in favor of toleration.

9. *The Union and its Consequences.*—The reign of Anne, so far as it relates to Scotland, centered in the accomplishment of the union. In spite of the disparity of numbers, both nations now met to treat on equal terms. Still there were grave difficulties, and it required all the wisdom of the ministers of the early years of Anne, aided by the glory of Marlborough's arms, to

overcome national prejudices and secure an object plainly for the benefit of both. The chief articles of the treaty were the settlement of both crowns according to the English Act of Succession on Anne and her descendants, and failing them on the electress Sophia and the Hanoverian line; the establishment of free trade between England and Scotland, and the admission of the Scots to equal privileges as regards trade with other countries; the national debt and taxation were adjusted by the imposition on Scotland of a moderate share ($240,000) of the land-tax, of which England was still to bear $1,000,000, and there was to be a uniform rate of custom and excise, Scotland being compensated by an equivalent of about $2,000,000 for becoming liable to a proportion of the English national debt, which already amounted to $80,000,000; forty-five representatives of Scotland were to be admitted to the House of Commons and sixteen elected peers to the House of Lords. Although the terms were on the whole favorable to Scotland, their announcement was received with dissatisfaction, especially in Edinburgh. The loss was immediate, from the abolition of an independent parliament, the reduction of the capital to a provincial town, and the increase of taxation to pay the growing national debt. The gain was in the future and in part doubtful. No one contemplated the rapid and enormous extension of trade. A proud people was unwilling to admit the advantage consequent upon free intercourse with a country in which wealth and civilization were more widespread. It had a natural attachment to its own institutions, though these were less popular than the English. It feared that, notwithstanding the most solemn guarantee, neither its church nor its laws could resist the influence of a country so much larger and more populous, in which henceforth was to be the sole seat of government, and that much of its wealth and talent would be attracted to the south and become English.

With the union of the parliaments Scotland lost its legislative independence. Its representation in the British parliament for more than a century, based on the freehold franchise in the counties and in the burghs controlled by town councils, which were close corporations, was a representation of special classes and interests rather than of the nation. It almost appeared as if the prophecy of Belhaven would be accomplished and there would be an end of an old song. But Scottish history was not destined yet to end. The character of the people, though their language and manners gradually became more like those of England, remained distinct. They retained a separate church and clergy. Independent courts and a more cosmopolitan system of law opened a liberal profession and afforded a liberal education to youthful ambition. A national system of parish schools, burgh schools, and universities, though inadequately endowed and far from reaching the ideal of Knox and Melville, gave opportunities to the lower as well as the higher classes of receiving at a small cost an education suited for practical uses and the business of everyday life. The Scot had been from the earliest times more inclined to travel, to migrate, to colonize, than the Englishman, not that he had a less fervent love of home, but a soil comparatively poor made it necessary for many to seek their fortune abroad. This tendency which had led Scottish monks, soldiers, and professors to embrace foreign service, now found new openings in trade, commerce, colonial enterprise in America, the East, and the West Indies, in the southern hemisphere and the exploration of unknown parts of the globe. Accustomed to poverty, Scottish emigrants acquired habits of frugality, industry, and perseverance, and were rewarded by success in most of their undertakings. Nor, if war be regarded as necessary to the continued existence of a nation, was it altogether absent, but the cause with which the name of Scotland became identified was the losing one. The two rebellions proved the devoted loyalty which still attached many of the Highland clans, the Catholics, and some of the Episcopalians to the descendants of the Stuarts. But that in 1715, preceded by an abortive attempt in 1708, was put down by a single battle; Sheriffmuir, if it could scarcely be claimed as a victory by Argyll, led to the speedy dispersal of the clans which had gathered round the standard of Mar. Thirty years later the romantic rising of the Highlanders under the Young Pretender found the government unprepared. Once more for a brief space Holyrood was a royal court. The defeat of Cope at Prestonpans and the rapid march of the Scottish army slightly reënforced by Catholics from the northern and midland shires of England, to Derby, by which it cut off the duke of Cumberland's forces from the capital, made London tremble. Divided counsels, the absence of any able leader, and the smallness of their number (not more than 5,000) prevented the daring policy of attacking London, which Charles himself favored, and a retreat was determined on. It was skillfully effected, and on December 26th the little army, which had left Edinburgh on October 31st and reached Derby on December 4th, arrived in Glasgow. It was not favorably received, the southwest of Scotland being the district least inclined to the Stuarts, and it marched on Stirling to assist Lord John Drummond and Lord Strathallen, who commenced its siege, which General Hawley threatened to raise. His defeat at Falkirk was the last success of the Jacobites.

During the remaining half of the eighteenth century and the commencement of the nineteenth a period of prosperity was enjoyed by Scotland, and the good effects of the union, intercepted by the rebellions, became visible. The Scottish nation, without losing its individuality, was stimulated by contact and friendly rivalry with its English neighbor in the arts of peace. It advanced in intellectual as well as material respects more than in any part of its previous history. It became, through commerce, manufactures, and improved agriculture, a comparatively rich instead of a poor country. Only two changes of importance occurred. The political institutions of Scotland were reformed by a series of acts which placed the franchise on a broader basis, and made the representation of the people real. The Established Church, already weakened by secessions, was further divided by a disruption largely due to the ignorance of political leaders as to the deep-seated aversion of the nation to any interference with the independence of the church, especially in matters of patronage. Educational reform has also in recent years raised the standard of the universities and schools without injuring their popular character. While it would be incorrect to say that Scotland has had no independent history since the union, that history must be chiefly read in the annals of its church, its law, and its literature. Its political existence has been absorbed in that of Great Britain.

Physical Features.—Scotland forms the northern portion of Great Britain, and is divided from England by the rivers Sark, Liddell, and Kershope (an affluent of the Liddell), the Cheviot Hills, the river Tweed, and the liberties of Berwick. The mainland lies between 58° 40′ 30″ (at Dunnet Head, Caithness) and 54° 38′ N. latitude (Mull of Galloway) and 1° 45′ 30″ (Peterhead) and 6° 14′ W. longitude (Ardnamurchan Point, Argyllshire). Including the islands, the extreme N. latitude is 60° 51′ 30″ (Outsack, Shetland) and the extreme W. longitude 8° 45′ 30″ (St. Kilda). Its greatest length from north to south, from Durness in Sutherland to Burrow Head in Wigtownshire, is 272 miles, and the greatest breadth from east to west, from Peterhead in Aberdeenshire to Applecross in Ross-shire, is 155, while the narrowest part, from Grangemouth in Stirlingshire to Bowling in Dumbartonshire, is only 30½ miles wide. The total area in 1881, according to the Ordnance Survey, was 19,777,490 acres or 30,902 square miles—the area of foreshore being 310,413 acres or 485 square miles, of water 403,846 acres or 631 square miles, and of land-surface 19,063,231 acres, or 29,796 square miles. But of the water area the acreage included under lakes and rivers respectively has not been ascertained.

Lakes.—These important features in the landscapes of Scotland present the general characters of the water-basins so profusely scattered over the northern parts of Europe and North America. They may be classified in four groups, each of which has its own peculiar scenery and a distinct mode of origin—(1) glen lakes, (2) rock-tarns, (3) moraine-tarns, (4) lakes of the plains.

(1) Glen lakes are those which occupy portions of glens. They are depressions in the valleys, not due to mere heaping up of detritus, but true rock-basins, often of great depth.

(2) Rock-tarns are small lakes lying in rock-basins on the sides of mountains or the summits of ridges, and on rocky plateaus or plains. Unlike the glen lakes, they have no necessary dependence upon lines of valley. On the contrary, they are scattered, as it were, broadcast over the districts in which they occur, and are by far the most abundant of all the lakes of the country.

(3) Moraine-tarns—small sheets of water ponded back by some of the last moraines shed by the retreating glaciers—are confined to the more mountainous tracts. Among the southern uplands many beautiful examples may be seen, probably the best known and certainly one of the most picturesque being the wild lonely Loch Skene lying in a recess of Whitcomb at the head of the Moffat Water. Others are sprinkled over the higher parts of the valleys of Galloway. None occur in the central Lowlands. In the Highlands they may be counted by hundreds, nestling in the bottoms of the corries. In the northwestern counties, where the glaciers continued longest to descend to the sea-level, lakes retained by moraine-barriers may be found very little above the sea.

(4) The lakes of the plains lie in hollows of the glacial detritus which is strewn so thickly over the lower grounds. As these hollows were caused by original irregular deposition rather than by erosion, they have no intimate relation to the present drainage-lines of the country. The lakes vary in size from mere pools up to wide sheets of water several square miles in area. As a rule they are shallow in proportion to their extent of surface. Though still sufficiently numerous in the Lowlands, they were once greatly more so, for, partly from natural causes and partly by artificial means, they have been made to disappear. The largest sheets of fresh water in the midland valley are of this class, as Loch Leven and the Lake of Menteith.

Coast-Line.—The eastern and western seaboards of Scotland present a singular contrast. The former is indented by a series of broad arms of the sea, but is otherwise tolerably unbroken. The land slopes gently down to the margin of the sea or to the edge of cliffs that have been cut back by the waves. The shores are for the most part low, with few islands in front of them, and cultivation comes down to the tide-line. The western side of the country, on the contrary, is from end to end intersected with long narrow sea lochs or fjords. The land shelves down rapidly into the sea and is fronted by chains and groups of islands. This contrast has sometimes been erroneously referred to greater erosion by the waves on the western than on the eastern coast. The true explanation, however, must be sought in the geological structure of the land.

Nearly the whole coast-line of Scotland is rocky. On the east side of the country, indeed, the shores of the estuaries are generally low, but the land between the mouths of these inlets is more or less precipitous. On the west side the coast is for the most part either a steep rocky declivity or a sea-wall, though strips of lower ground are found in the bays.

While no islands except mere solitary rocks like May Island, the Bass Rock, and Inchkeith diversify the eastern seaboard, the western side of Scotland presents a vast number, varying in size from such extensive tracts as Skye down to the smallest sea-stack or skerry. Looked at in the broadest way, these numerous islands may be regarded as belonging to two groups or series—the Outer and the Inner Hebrides. The Outer Hebrides, extending from Barra Head to the Butt of Lewis, consist of a continuous chain of islands composed (with the exception of a small tract in the east of Lewis) entirely of Archæan rocks. Most of the ground is low, rocky, and plentifully dotted over with lakes; but it rises into mountainous heights in Harris, some of the summits attaining elevations of 2,600 feet. The general trend of this long belt of islands is north-northeast. The Inner Hebrides form a much less definite group. They may be regarded as beginning with the Shiant Isles in the Minch and stretching to the southern headlands of Isla, the most important members being Skye, Mull, Isla, Jura, Rum, Eigg, Coll, Tiree, and Colonsay. The irregularity of this fringe of islands has no doubt been in chief measure brought about by its remarkable diversity of geological structure. Archæan gneiss, Cambrian sandstone, Silurian quartzite, limestone, and schist, Jurassic sandstone and limestone, Cretaceous sandstone, and Tertiary basalts, gabbros, and granitic rocks all enter into the composition of the islands.

Climate.—In considering the climate of Scotland the first place must be assigned to the temperature of the various districts during the months of the year, it being this which gives the chief characteristics of climate and not the mean temperature of the whole year. Thus, while the annual temperatures of the west and east coasts are nearly equal, the summer and winter temperatures are very different. At Portree (on east coast of Skye) the mean temperatures of January and July are 39° and 56.8°, whereas at Perth they are 37.5° and 59.0°. The prominent feature of the isothermals of the winter months is their north and south direction, thus pointing not to the sun but to the warm waters of the Atlantic as the more powerful influence in determining the Scottish climate at this season through the agency of the prevailing westerly winds. The Atlantic is in truth a vast repository of heat, in which the higher temperature of summer and that of more southern latitudes are treasured up against the rigors of winter; and in exceptionally cold seasons the ocean protects all places in its more immediate neighborhood against the severe frosts which occur in inland situations. While this influence of the ocean is felt at all seasons, it is most strikingly seen in winter; and it is more decided in proportion as the locality is surrounded by the warm waters of the Atlantic. At Edinburgh the temperature is 27.0° and at Lerwick 32.5° higher than would otherwise be the case; in other words, but for the ameliorating influence of the Atlantic the temperature of Edinburgh in midwinter would only be 12.5° and of Lerwick 7.5°, or such winters as characterize the climates of Greenland and Iceland. The influence of the North Sea is similarly apparent, but in a less degree. Along the whole of the eastern coast, from the Pentland Firth southward, temperature is higher than what is found a little inland to the west.

Population; Vital and Social Statistics.—At the end of the fifteenth century it is supposed that the population of Scotland did not exceed 500,000, Edinburgh having about 20,000 inhabitants, followed by Perth with about 9,000, and Aberdeen, Dundee, and St. Andrews each with about 4,000. By the time of the Union in 1707 it is supposed to have reached 1,000,000, while according to the returns furnished by the clergy to Doctor Webster in 1755 it was 1,265,380. At the time of the first government census in 1801 it had reached 1,608,420. The increase through all the succeeding decades has been continuous, though fluctuating in amount, and in 1881 it had reached 3,735,573 (males 1,799,475, females 1,936,098), an increase within the eighty years of 132 per cent. During the same period the population of England and Wales had increased 192 per cent., while the population of Ireland, owing to a rapid decrease since 1841, does not now differ greatly from what it was at the beginning of the century.

Scotland possesses two canals constructed primarily to abridge the sea passage round the coast—the Caledonian and the Crinan. The Caledonian canal, extending from southwest to northeast, a distance of sixty miles along the line of lochs from Loch Linnhe on the west coast to the Moray Firth on the east coast, was begun in 1803, opened while yet unfinished in 1822, and completed in 1847, the total cost being about £1,300,000. The Crinan canal, stretching across the Mull of Cantyre from Loch Gilp to Jura Sound, a distance of nine miles, and admitting the passage of vessels of 200 tons burden, was opened in 1801 at a cost of over £100,000. The principal boat canals are the Forth and Clyde or Great Canal, begun in 1798, between Grangemouth on the Forth and Bowling on the Clyde, a distance of 30¼ miles, with a branch to Port Dundas, making the total distance 33¾ miles; the Union canal between Edinburgh and the Forth and Clyde canal at Port Dundas, near Glasgow, completed in 1822; and the Monkland canal, completed in 1791, connecting Glasgow with the Monkland mineral district and communicating with a lateral branch of the Forth and Clyde canal at Port Dundas. Several other canals in Scotland have been superseded by railway routes.

The first railway in Scotland for which an Act of Parliament was obtained was that between Kilmarnock and Troon (9¾ miles), opened in 1812, and, of course, worked by horses. A similar railway, of which the chief source of profit was the passenger traffic, was opened between Edinburgh and Dalkeith in 1831, branches being afterward extended to Leith and Musselburgh. By 1840 the length of the railway lines in Scotland for which bills were passed was 191¼ miles, the capital being £3,122,133. The chief railway companies in Scotland are the Caledonian, formed in 1845, total capital £37,999,933; the North British, total capital £32,821,526; the Glasgow and Southwestern, formed by amalgamation in 1850, total capital £13,230,849; the Highland, formed by amalgamation in 1865, total capital £4,445,316; and the Great North of Scotland, 1846, total capital £4,869,983. The management of the small branch lines belonging to local companies is generally undertaken by the larger companies.

Notwithstanding the unsatisfactory condition of agricultural affairs in Scotland at present, there is no country in the world where farming is prosecuted with more skill and enterprise. On account of the great variety of soil and climate the methods in operation differ greatly in different districts, and for special details the reader is referred to the articles on the several counties.

Mining Industries.—The chief sources of the mineral wealth of Scotland are coal and iron, which are generally found in convenient juxtaposition. The privilege of digging coal in the lands of Pittencrieff was conferred by the charter on the abbot and convent of Dunfermline in 1291, and at a very early period the monks of Newbattle Abbey dug coal from surface-pits on the banks of the Esk. Æneas Sylvius (afterward Pope Pius II.), who visited Scotland in the fifteenth century, refers to the fact that the poor people received at the church doors a species of stone which they burned in place of wood; but, although the value of coal for smith's and artificer's work was early recognized, it was not generally employed for domestic purposes till about the close of the sixteenth century. In 1606 an act was passed binding colliers to perpetual service at the works at which they were engaged, and their full emancipation did not take place till 1799. An act was passed in 1843 forbidding the employment of children of tender years and of women in underground mines. According to the census of 1851, the number of persons engaged in connection with coal-mining was 36,973 males and 358 females (the latter employed above ground), and in 1881 the numbers were 53,340 and 401.

The rise of the iron industry in Scotland dates from the establishment in 1760 of the Carron ironworks near Falkirk. The number of persons employed in iron-mining in 1851 was 7,648, and in iron manufacture 13,296; and by 1881 the numbers had increased respectively to 10,473 and 38,309.

Since about the years 1850–55 shale-mining has become an important industry, especially in Linlithgowshire and Midlothian. Lead ore is worked at Abington in Lanarkshire and Wanlockhead in Dumfriesshire. Stone quarrying, especially of granite, sandstone, flagstone, slate, and limestone, is extensively carried on. The number of persons engaged in quarries in 1881 was 13,742, and the value of the materials raised was estimated at £1,030,650. The principal granite works occur in Aberdeenshire and Kirkcudbrightshire, while freestone quarries are common throughout the greater part of the Lowland district, although whinstone also is frequently used for building purposes. Large quantities of paving stones are exported from Caithness and Forfarshire, and there are very extensive slate-quarries at Ballachulish and other places in Argyllshire.

Manufactures.—Although a company of woolen weavers was incorporated by the town council of Edinburgh in 1475, the cloth worn by the wealthier classes down to the beginning of the seventeenth century was of English or French manufacture, the lower classes wearing "coarse cloth made at home," in the fashion still prevailing in the remoter districts of the Highlands. In 1601 seven Flemings were brought to Edinburgh by commissioners from the burghs to instruct the people in the manufacture of serges and broadcloth, and eight years later a company of Flemings was established in the Canongate (Edinburgh) for the manufacture of cloth under the special protection of the king; but, notwithstanding also the establishment in 1681 of an English company for the manufacture of woolen fabrics near Haddington, the industry for more than fifty years after this made very tardy progress in the country. In fact its importance dates from the introduction and improvement of machinery in the nineteenth century. The most important branch of the trade, that of tweeds, first began to attract attention shortly after 1830; though still having its principal seat in the district from which it takes its name, including Galashiels, Hawick, Innerleithen, and Selkirk, it extends to a large number of towns throughout Scotland, especially to Aberdeen, Elgin, Inverness, Stirling, Bannockburn, and Paisley. The chief seat of the hosiery trade is Hawick. Carpet manufacture has had its principal seat in Kilmarnock since 1817, but is also carried on in Aberdeen, Ayr, Bannockburn, Glasgow, Paisley, and other towns. Tartans are largely manufactured in Tillicoultry, Bannockburn, and Kilmarnock, and shawls and plaids are largely manufactured in several towns.

The manufacture of cloth from flax is of very ancient date in Scotland. Principally owing to foreign competition, the linen manufacture has within recent years been in a very languid condition.

The first cotton mill in Scotland was built at Rothesay by an English company in 1778. Nine-tenths of the cotton-factories of Scotland are now concentrated in Glasgow, Paisley, and the neighboring towns, but the industry extends into other districts of the west of Scotland and is also represented in the counties of Aberdeen, Perth, and Stirling. Silk is manufactured in Paisley and Glasgow, but the industry is of minor importance, employing only about 600 persons. Floorcloth is manufactured at Kirkcaldy, where also the first linoleum factory in Scotland was established in 1877.

Next to textile fabrics, the most important manufacture in Scotland is that of whisky, in which it has Ireland for its only competitor.

Though ale has been superseded by whisky as the national beverage, Scotland still possesses several large breweries, and Edinburgh ales vie in repute with those of Burton-on-Trent.

The first sugar-refinery in Scotland was erected in 1765, in Greenock, where the industry made rapid progress and has still its principal seat, although it is extensively carried on in Leith and in a lesser degree in Glasgow and Dundee. Glass-making, introduced in 1610 by Sir John Hay, at Wemyss, in Fife, is now of considerable importance, Edinburgh being celebrated for the finer branches of the manufacture. A paper-mill was erected in 1675 at Dalry Mills, on the Water of Leith, in which French workmen were employed to give instruction, with the result, as was reported by the owners, that "grey and blue paper was produced much finer than ever was done before in the kingdom." The most important seat of the industry is now Valleyfield, near Penicuik, where it was introduced in 1709. Edinburgh has since the time of the Ballantynes enjoyed a widely-extended fame for the excellence and beauty of its printing. The other manufactures prevailing in different parts of Scotland, such as those of leather, soap, earthenware and hardware, carriages, and the various implements and utensils in general use, do not call for special characterization.

The value of the imports into Scotland is only about a tenth of that of England, but this does not represent the proper proportion of foreign imports used or consumed in Scotland, as large quantities find their way to Scotland from England by rail—nearly all the tea, for example, consumed in Great Britain being imported into London, while various other ports have almost a monopoly of certain other imports. Reckoning by the combined value of their imports and exports, the principal ports of Scotland are Glasgow, Leith, Greenock, Dundee, Grangemouth, and Aberdeen, in the order named, but for particulars regarding the trade of these and other ports reference must be made to the articles on the several towns.

For many of the most important improvements in the construction of ships, especially steam vessels, Great Britain is indebted to the enterprise and skill of the Clyde shipbuilders. From the time of the construction by Mr. Robert Napier of the steamers for the Cunard line, formed in 1840, the shipbuilders on the Clyde have enjoyed an unrivaled reputation for the construction of large ocean steamers, both as regards mechanical appliances and the beauty and convenience of the internal arrangements. Shipbuilding is also carried on to a considerable extent at Dundee, Leith, and Aberdeen, and to a certain degree at most of the ports of the kingdom, but within recent years the industry has been in a very fluctuating condition, the tonnage of the vessels constructed annually varying between 1880 and 1890 from a little over 100,000 to nearly 300,000.

SCOTLAND, CHURCH OF. In the article PRESBYTERIANISM the history of the Church of Scotland was brought down to the middle of the eighteenth century, and the story of the secessions of 1733 and 1751 was there told. We take up here the church's history at the beginning of the "Moderate" rule. Her annals during the next three-quarters of a century are singularly uneventful. In close alliance with the state, she increases in power and dignity, and becomes the home of letters and philosophy. But there is no great movement of a theological nature, no striking religious development to lend her popular interest.

The strength of the church as well as her tendency to moderation arose in great part out of the political circumstances of the early part of the eighteenth century. Presbytery, being loyal to the house of Hanover, while Episcopacy was Jacobite, enjoyed the royal favor and was treated as a firm ally of the Government. The Patronage Act of 1712 threw the filling up of parishes into the hands of those well-affected to the Government, and the example of the mode of patronage practiced in England may have tended to promote a disregard of the religious feelings of the people. The effect on the clergy was to encourage them to seek the friendship of the landed gentry and to regard the higher rather than the lower orders of society as their natural allies, so that they were at the same time led to liberal ways of thinking and rendered largely independent of their congregations.

The religious state of the Highlands, to which at the period of the Union the Reformation had only very partially penetrated, occupied the attention of the church during the whole of the eighteenth century. In 1725 the gift called the "royal bounty" was first granted—a subsidy amounting at first to £1,000 per annum, increased in George IV.'s reign to £2,000 and continued to the present day; its original object was to assist the reclamation of the Highlands from Roman Catholicism by means of catechists and teachers. The Society for Propagating Christian Knowledge, incorporated in 1709, with a view partly to the wants of the Highlands, worked in concert with the Church of Scotland, setting up schools in remote and destitute localities, while the church promoted various schemes for the dissemination of the Scriptures in Gaelic and the encouragement of Gaelic students. In consequence of these efforts Roman Catholicism now lingers only in a few islands and glens on the west coast.

With the close of the eighteenth century a great change passed over the spirit of the church. The new activity which sprang up everywhere after the French Revolution produced in Scotland a revival of Evangelicalism which has not yet spent its force. Moderatism had cultivated the ministers too fast for the people, and the church had become to a large extent more of a dignified ruler than a spiritual mother. About this time the brothers Robert and James Haldane devoted themselves to the work of promoting Evangelical Christianity, James making missionary journeys throughout

Scotland and founding Sunday schools; and in 1798 the eccentric preacher Rowland Hill visited Scotland at their request.

The growth of Evangelical sentiment in the church, along with the example of the great missionary societies founded in the end of the eighteenth and the beginning of the nineteenth century, led to the institution of the various missionary schemes still carried on, and their history forms the chief part of the history of the church for a number of years. The education scheme, having for its object the planting of schools in destitute Highland districts, came into existence in 1824. The foreign mission committee was formed in 1825, at the instance of Doctor Inglis, a leader of the Moderate party; and Doctor Duff went to India in 1829 as the first missionary of the Church of Scotland. The church extension committee was first appointed in 1828, and in 1834 it was made permanent. The colonial scheme was inaugurated in 1836, and the Jewish mission in 1838, M'Cheyne and Andrew Bonar setting out in the following year as a deputation to inquire into the condition of the Jews in Palestine and Turkey and on the continent of Europe.

The zealous orthodoxy of the church found at this period several occasions to assert itself. M'Leod Campbell, minister of Row, was deposed by the assembly of 1830 for teaching that assurance is of the essence of faith and that Christ died for all men. He has since been recognized as one of the profoundest Scottish theologians of the nineteenth century, although his deposition has never been removed.

The Ten Year's Conflict, which began in 1833 with the passing by the assembly of the Veto and the Chapel Acts, is treated in the article FREE CHURCH OF SCOTLAND.

The Disruption left the Church of Scotland in a sadly maimed condition. Of 1,203 ministers 451 left her, and among these were many of her foremost men. A third of her membership is computed to have gone with them. In Edinburgh many of her churches were nearly empty. The Gaelic-speaking population of the northern counties completely deserted her. All her missionaries left her but one. She had no gale of popular enthusiasm to carry her forward, representing as she did not a newly arisen principle but the opposition to a principle which she maintained to be dangerous and exaggerated. For many years she had much obloquy to endure. But she at once set herself to the task of filling up vacancies and recruiting the missionary staff. A lay association was formed, which raised large sums of money for the missionary schemes, so that their income was not allowed seriously to decline. The good works of the church, indeed, were in a few years not only continued but extended. All hope being lost that parliament would endow the new churches built by the church extension scheme of Doctor Chalmers, it was felt that this also must be the work of voluntary liberality. Under Dr. James Robertson, professor of church history in Edinburgh, one of the leading champions of the Moderate policy in the Ten Years' Conflict, the extension scheme was transformed into the endowment scheme, and the church accepted it as her duty and her task to provide the machinery of new parishes where they were required. By 1854 thirty new parishes had been added at a cost of $650,000, and from this time forward the work of endowment proceeded still more rapidly.

In 1874 patronage was abolished. The working of Lord Aberdeen's Act had given rise to many unedifying scenes and to lengthy struggles over disputed settlements, and it was early felt that some change at least was necessary in the law. The agitation on the subject went on in the assembly from 1857 to 1869, when the assembly by a large majority condemned patronage as restored by the Act of Queen Anne, and resolved to petition parliament for its removal. The request was granted, and the right of electing parish ministers was conferred on the congregation; thus a grievance of old standing, from which all the ecclesiastical troubles of a century and a half had sprung, was removed and the church placed on a thoroughly democratic basis. The church has greatly increased of late years in liberality of sentiment, and there has been no deposition for heresy since 1843.

SCOTLAND, LITERATURE OF. Literature in Scotland, as distinct from England, dates from the time of COLUMBA, (*q.v.*) Adamnan, abbot of Iona, who in 690 wrote in Latin the life of his predecessor, may be regarded as the first author that Scotland produced. Three Arthurian romances taken from Anglo-Norman sources relating to Sir Gawain, one of the most celebrated knights of the Round Table, seem to have been composed about the end of the thirteenth century. These were—*Syr Gawayn and the Grene Knycht*, the *Knightly Tale of Golagros and Gawayne*, and the *Awntyrs of Arthur at the Ternewathelyne.*

The war of independence gave a new impetus to Scottish nationality and produced a corresponding effect on the literature of the country. Among these early authors may be mentioned Barbour, Fordun, Bower, Wyntoun, and King James I.

The close of the fifteenth century exhibited a considerable growth of literary ability in the writings of William DUNBAR (*q.v.*) and his contemporaries. The most classical of the Scottish poets was Gawyn or Gavin DOUGLAS (*q.v.*) bishop of Dunkeld, whose great literary work was the translation of the *Æneid* of Virgil into Scottish verse. Contemporary with Douglas was Sir David LYNDSAY (*q.v.*), Lyon king-of-arms in the reign of James V., who may be regarded as the most popular of the early Scottish poets. Another Scottish author who wrote in Latin with considerable elegance was Hector BOECE (*q.v.*), principal of King's College, Aberdeen. A Latin poem of much merit, entitled *De animi tranquillitate*, was published in 1543 by Florence Wilson, master of Carpentras School.

In 1552 there was printed at St. Andrews a *Catechism, that is to say ane Commone and Catholike Instructioun of the Christian People in Materis of our Catholike Faith and Religioun*, written by John Hamilton, archbishop of St. Andrews, the last primate of the Roman Catholic faith in Scotland. The poems of Sir Richard Maitland, which are of a somewhat satirical kind, are valuable, as they, like those of Lyndsay, contain much information about the abuses of the time. The name of George Bannatyne is inseparably connected with the history of Scottish poetry, as in 1568 he, too, formed an extensive collection of Scottish poetry, which is certainly the most valuable now extant. The works of Alexander Scott, consisting principally of love poems, embrace also a spirited account of a *Jousting betwixt Adamson and Sym* at the Drum, a place a little to the south of Edinburgh. To this period belong two poems of considerable length—the *Court of Venus* (1575), an imitation of the *Palice of Honour* of Gawyn Douglas, and the romance of the *Seaven Seages* (1578). These poems were written by John Rolland, notary in Dalkeith. One of the best Latin scholars that modern Europe has produced was George BUCHANAN (*q.v.*), who flourished in the middle of the sixteenth century. An excellent specimen of the ancient vernacular language is the *Chronicle of Scotland*, by Robert Lyndsay, of Pitscottie. Another historical work of greater importance was the *De origine, mori-*

bus, et rebus gestis Scotorum (1578) by John Lesley, bishop of Ross.

The Reformation exerted a considerable influence on Scottish literature. Among the earliest Protestant writers of the country may be mentioned Alexander Ales or Alesius. But the most eminent of promoters of the reform was John Knox. The writings of James VI., who was a man of scholarly attainments, embrace several works both in poetry and prose. Among the Scottish poets who frequented his court were William Fowler, the elegant translator of the *Triumphs* of Petrarch, and Stewart of Baldinnies (Perth), a translator of Ariosto. The zeal of Sir David Lyndsay, and others, for the reformation of the church initiated a religious revival, and, in 1597, was published the collection known as *Ane Compendious Booke of Godly and Spiritual Sangs for avoiding of Sinne and Harlotrie.* This very curious work is attributed to John and Robert Wedderburn, the latter of whom was a vicar of Dundee. A number of religious poems were written about the end of the sixteenth century by James Melville, minister of Anstruther, afterward of Kilrenny, both in Fife. A very popular poem, the *Cherrie and the Slae*, first printed by Waldegrave at Edinburgh in 1597, afterward went through many editions. Its author was Alexander Montgomerie. To the beginning of the seventeenth century belongs a comedy in rhyming stanza, the authorship of which is unknown—*Ane verie Excellent and Delectabill Treatise intitulit Philotus, quhairin we may perceive the Greit Inconveniences that fallis out in the Marriage betuix Aige and Youth* (1603). In the same year appeared the poems of Sir William ALEXANDER (*q.v.*), earl of Stirling. One of the most distinguished writers of this era was William DRUMMOND (*q.v.*) of Hawthornden. Nearly contemporary with Drummond was Patrick Hannay, a native of Galloway, who seems to have followed James to England. He published his poems in 1622, the principal of which are *Philomela the Nightingale*, and *Sheretrine and Mariana.* He occupies a favorable position among the minor Scottish poets. After the removal of the Scottish court to London and the union of the crowns in 1603, the old language began to be considered as a provincial dialect; and the writers subsequent to Drummond, who was the first Scottish poet that wrote well in English, take their places among British authors.

SCOTT, DAVID, historical painter, was born at Edinburgh in October, 1806, and studied under his father, Robert Scott, an engraver of repute in the city. For a time in his youth he occupied himself with the burin; but he soon turned his attention to original work in color, and in 1828 he exhibited his first oil picture, the *Hopes of Early Genius Dispelled by Death*, which was followed by *Cain*, *Nimrod*, *Adam and Eve Singing their Morning Hymn*, *Sarpedon Carried by Sleep and Death*, and other subjects of a poetic and imaginative character. In 1829 he became a member of the Scottish Academy. In addition to his works in color Scott executed several remarkable series of designs. Two of these—*The Monograms of Man* and the *Illustrations to Coleridge's Ancient Mariner*—were etched by his own hand, and published in 1831 and 1837 respectively, while his subjects from the *Pilgrim's Progress* and Nichol's *Architecture of the Heavens* were issued after his death. Among his literary productions are five elaborate and thoughtful articles on the characteristics of the Italian masters, published in *Blackwood's Magazine*, 1839 to 1841, and a pamphlet on *British*, *French*, *and German Painting*, 1841. He died in Edinburgh on March 5, 1849.

SCOTT, SIR GEORGE GILBERT, one of the most successful English ecclesiastical architects of the nineteenth century, was born in 1811 at Gawcott near Buckingham, England. In 1862–63 he was employed to design and construct the Albert Memorial, a very costly and elaborate work, in the style of a magnificent thirteenth century reliquary or ciborium, adorned with many statues and reliefs in bronze and marble. On the partial completion of this he received the honor of knighthood. In 1866 he competed for the new London law-courts, but the prize was adjudged to his old pupil, G. E. Street. He died in 1878. He was buried in the nave of Westminster Abbey, and an engraved brass, designed by G. E. Street, was placed over his grave.

SCOTT, JOHN. See ELDON, EARL OF.

SCOTT, MICHAEL. See SCOT, MICHAEL.

SCOTT, SIR WALTER, poet and novelist, was born at Edinburgh on August 15, 1771. Left very much to himself throughout his boyhood in the matter of reading, so quick, lively, excitable, and uncertain in health that it was considered dangerous to press him and prudent rather to keep him back, Scott began at a very early age to accumulate the romantic lore of which he afterward made such splendid use. As a child he seems to have been an eager and interested listener and a great favorite with his elders, apparently having even then the same engaging charm that made him so much beloved as a man. Chance threw him in the way of many who were willing to indulge his delight in stories and ballads. At the age of six he was able to define himself as "a virtuoso," "one who wishes to and will know everything." At ten his collection of chap-books and ballads had reached several volumes, and he was a connoisseur in various readings. Thus he took to the High School, Edinburgh, when he was strong enough to be put in regular attendance, an unusual store of miscellaneous knowledge and an unusually quickened intelligence, so that his master "pronounced that, though many of his schoolfellows understood the Latin better, *Gualterus Scott* was behind few in following and enjoying the author's meaning."

Throughout his school days and afterward when he was apprenticed to his father, attended university classes, read for the bar, took part in academical and professional debating societies, Scott steadily and ardently pursued his own favorite studies. His reading in romance and history was really study, and not merely the indulgence of an ordinary schoolboy's promiscuous appetite for exciting literature. In fact, even as a schoolboy he specialized.

This early, assiduous, unintermittent study was the main secret, over and above his natural gifts, of Scott's extempore speed and fertility when at last he found forms into which to pour his vast accumulation of historical and romantic lore.

Scott's preparation for painting the life of past times was probably much less unconsciously such than his equally thorough preparation for acting as the painter of Scottish manners and character in all grades of society. With all the extent of his reading as a schoolboy and a young man he was far from being a cloisteral student, absorbed in his books. In spite of his lameness and his serious illnesses in youth, his constitution was naturally robust, his disposition genial, his spirits high; he was always well to the front in the fights and frolics of the High School, and a boon companion in the "high jinks" of the junior bar. The future novelist's experience of life was singularly rich and varied.

His father intended him originally to follow his own business, that of writer to the cynet (or attorney), and he was apprenticed in his sixteenth year; but he preferred the upper walk of the legal profession, and was admitted a member of the faculty of advocates in 1792. He seems to have read hard at law for four years at least, but almost from the first to have limited his ambition to obtaining some comfortable appointment such as would leave him a good deal of leisure for literary pursuits. In this he was not disappointed. In 1799 he obtained the office of sheriff-depute of Selkirkshire, with a salary of 300 pounds and very light duties. In 1806 he obtained the reversion of the office of clerk of session.

Scott's profession, in addition to supplying him with a competent livelihood, supplied him also with abundance of opportunities for the study of men and manners. Characters of all types and shades find their way into courts of law. The wonder is that so much technical drudgery did not crush every particle of romance out of him; but such was the elasticity and strength of his powers that this daily attendance at the transaction of affairs in open court face to face with living men—under a strain of attention that would have exhausted an ordinary man's allowance of energy—seems rather to have helped him in giving an atmosphere of reality to his representations of the life of the past.

It was not, however, as a prose writer that he was first to make a reputation. The common notion is that Scott, having made a reputation as a poet, was led to attempt romances in prose by a chance impulse, hitting upon the new vein as if by accident. The truth seems rather to be that, as it is his prose romances which give the fullest measure of his genius, so the greater part of his early life was a conscious or unconscious preparation for writing them; whereas his metrical romances, in every way slighter and less rich and substantial, were, comparatively speaking, a casual and temporary deviation from the main purpose of his life. According to his own account, he was led to adopt the medium of verse by a series of accidents. The story is told by himself at length and with his customary frankness and modesty in the *Essay on Imitations of the Ancient Ballad*, prefixed to the 1830 edition of his *Border Minstrelsy*, and in the 1830 introduction to the *Lay of the Last Minstrel*. Having read Lewis' *Monk*, he believed he could write such poetry himself. "Finding Lewis," he says, "in possession of so much reputation, and conceiving that if I fell behind him in poetical powers, I considerably exceeded him in general information, I suddenly took it into my head to attempt the style of poetry by which he had raised himself to fame." Accordingly, he composed *Glenfinlas*, *The Eve of St. John*, and the *Gray Brother*. But he soon became convinced that "the practice of ballad-writing was out of fashion, and that any attempt to revive it or to found a poetical character on it would certainly fail of success." His study of Goethe's *Götz von Berlichingen*, of which he published a translation in 1799, gave him wider ideas. Why should he not do for ancient Border manners what Goethe had done for the ancient feudalism of the Rhine? He had been busy since his boyhood collecting Scottish Border ballads and studying the minutest details of Border history. He began to cast about for a form which should have the advantage of novelty, and a subject which should secure unity of composition. He was engaged at the time preparing a collection of the *Minstrelsy of the Scottish Border*. The first installment was published in 1802; it was followed by another next year, and by an edition and continuation of the old romance of *Sir Tristram*.

The *Lay of the Last Minstrel* appeared in January, 1805 and at once became widely popular. It sold more rapidly than poem had ever sold before. Scott was astonished at his own success, although he expected that "the attempt to return to a more simple and natural style at poetry was likely to be welcomed."

The success of the *Lay* decided finally, if it was not decided already, that literature was to be the main business of Scott's life, and he proceeded to arrange his affairs accordingly.

When the *Lay* was off his hands, Scott's next literary enterprise was a prose romance—a confirmation of the argument that he did not take to prose after Byron had "*bet* him," as he put it, in verse, but that romance writing was a long-cherished purpose. He began *Waverley*, but a friend to whom he showed the first chapters—which do not take Waverley out of England, and describe an education in romantic literature very much like Scott's own—not unnaturally decided that the work was deficient in interest and unworthy of the author of the *Lay*. Scott accordingly laid *Waverley* aside. We may fairly conjecture that he would not have been so easily diverted had he not been occupied at the time with other heavy publishing enterprises calculated to bring grist to the printing establishment. His active brain was full of projects for big editions, which he undertook to carry through on condition that the printing was done by Ballantyne & Co., the "Co." being kept a profound secret, because it might have injured the lawyer and poet professionally and socially to be known as a partner in a commercial concern. Between 1806 and 1812, mainly to serve the interests of the firm, though of course the work was not in itself unattractive to him, Scott produced his elaborate editions of Dryden, Swift, the Somers Tracts, and the Sadler State papers. Incidentally these laborious tasks contributed to his preparation for the main work of his life by extending his knowledge of English and Scottish history.

Marmion, begun in November, 1806, and published in February, 1808, was written as a relief to "graver cares."

The triumphant success of *Marmion*, establishing him as *facile princeps* among living poets, gave Scott such a *heeze*, to use his own words, "as almost lifted him off his feet." He touched then the highest point of prosperity and happiness. Presently after, he was irritated and tempted by a combination of little circumstances into the great blunder of his life, the establishment of the publishing house of John Ballantyne & Co.

The *Lady of the Lake* (May, 1810) was the first great publication by the new house. It was received with enthusiasm, even Jeffrey joining in the chorus of applause. It made the Perthshire Highlands fashionable for tourists, and raised the post-horse duty in Scotland. But it did not make up to Ballantyne & Co. for their heavy investments in unsound ventures. The *Edinburgh Annual Register*, meant as a rival to the *Edinburgh Review*, though Scott engaged Southey to write for it, and wrote for it largely himself, proved a failure. By the end of three years Scott began to write to his partners about the propriety of "reefing sails." But apparently he was too much occupied to look into the accounts of the firm, and, so far from understanding the real state of their affairs, he considered himself rich enough to make his first purchase of land at Abbotsford. But he had hardly settled there in the spring of 1812, and begun his schemes for building and planting and converting a bare moor into a richly wooded *pleasaunce*, than his business troubles began, and he found himself harassed by fears of bankruptcy. The proceeds of *Rokeby* (January, 1813), and of other labors of Scott's pen were swallowed up, and bankruptcy was inevitable, when Constable, still eager at any price to secure Scott's services, came to the rescue. With his help three crises were tided over in 1813.

It was in the midst of these ignoble embarrassments that Scott opened up the rich new vein of the Waverley novels. He chanced upon the manuscript of the opening chapters of *Waverley*, and resolved to complete the story. Four weeks in the summer of 1814 sufficed for the work, and *Waverley* appeared without the author's name in July. His treatises on chivalry, romance, and the drama, besides an elaborate work in two volumes on Border antiquities, appeared in the same year with *Waverley*, and his edition of Swift in nineteen volumes in the same week. The *Lord of the Isles* was published in January, 1815; *Guy Mannering*, written in "six weeks about Christmas," in February; *Paul's Letters to his Kinsfolk* and *The Field of Waterloo* in the same year. *Harold the Dauntless*, not to mention the historical part of the *Annuai Register*, appeared in the same year with *The Antiquary*, *The Black Dwarf*, and *Old Mortality* (1816).

Scott's fertility is not absolutely unparalleled; the late Mr. Trollope claimed to have surpassed him in rate as well as in total amount of production, having also business duties to attend to. But in speed of production combined with variety and depth of interest and weight and accuracy of historical substance Scott is still unrivalled.

The immense strain of Scott's double or quadruple life as sheriff and clerk, hospitable laird, poet, novelist, and miscellaneous man of letters, publisher, and printer, though the prosperous excitement sustained him for a time, soon told upon his health. Early in 1817 began a series of attacks of agonizing cramp of the stomach, which recurred at short intervals during more than two years. But his appetite and capacity for work remained unbroken. He made his first attempt at playwriting as he was recovering from the first attack; before the year was out he had completed *Rob Roy*, and within six months it was followed by *The Heart of Midlothian*, which by general consent occupies the highest rank among his novels. The *Bride of Lammermoor*, *The Legend of Montrose*, and *Ivanhoe* were dictated to amanuenses, through fits of suffering so acute that he could not suppress cries of agony. Still he would not give up. The first of the series concerning which there were murmurs of dissatisfaction was *The Monastery*, which was the first completed after the reëstablishment of the author's bodily vigor. The failure, such as it was, was due rather to the subject than the treatment, and *The Abbot*, in which Mary Queen of Scots is introduced, was generally hailed as fully sustaining the reputation of "the Great Unknown." *Kenilworth*, *The Pirate*, *The Fortunes of Nigel*, *Peveril of the Peak*, *Quentin Durward*, *St. Ronan's Well*, *Redgauntlet*, followed in quick succession in the course of three years, and it was not till the last two were reached that the cry that the author was writing too fast began to gather volume. *St. Ronan's Well* was very severely criticised and condemned. *The Fortunes of Nigel* comes comparatively late in the series and has often been blamed for its looseness of construction.

Toward the close of 1825, after eleven years of brilliant and prosperous labor, encouraged by constant tributes of admiration, homage, and affection such as no other literary potentate has ever enjoyed, realizing his dreams of baronial splendor and hospitality on a scale suited to his large literary revenues, Scott suddenly discovered that the foundations of his fortune were unsubstantial. He had imagined himself clear of all embarrassments in 1818, when all the unsalable stock of John Ballantyne & Co. was bargained off by Rigdum to Constable for Waverley copyrights, and the publishing concern was wound up. But a few weeks revealed the unpleasant truth that, owing to the way in which Ballantyne & Co. were mixed up with Constable & Co., and Constable with Hurst & Robinson, the failure of the London house threw upon him personal responsibility for $650,000.

How Scott's pride rebelled against the dishonor of bankruptcy, how he toiled for the rest of his life to clear off this enormous debt, declining all offers of assistance and asking no consideration from his creditors except time, and how nearly he succeeded, is one of the most familiar chapters in literary history, and would be one of the saddest were it not for the heroism of the enterprise. His wife died soon after the struggle began, and he suffered other painful bereavements; but, though sick at heart, he toiled on indomitably, and, writing for honor, exceeded even his happiest days in industrious speed. If he could have maintained the rate of the first three years, during which he completed *Woodstock*, three *Chronicles of the Canongate*, *The Fair Maid of Perth*, *Anne of Geierstein*, the *Life of Napoleon* (involving much research, and equal in amount to thirteen novel volumes), part of his *History of Scotland*, the Scottish series of *Tales of a Grandfather*, besides several magazine articles, some of them among the most brilliant of his miscellaneous writing, and prefaces and notes to a collected edition of his novels—if he could have continued at this rate he might soon have freed himself from all his incumbrances. The result of his exertions from January, 1826, to January, 1828, was nearly $200,000 for his creditors. But the terrific labor proved too much even for his endurance. Ugly symptoms began to alarm his family in 1829, and in February of 1830 he had his first stroke of paralysis. Still he was undaunted, and not all the persuasions of friends and physicians could induce him to take rest. He had a slight touch of apoplexy in November and a distinct stroke of paralysis in the following April; but in spite of these warnings and other bodily ailments, he had two more novels, *Count Robert of Paris* and *Castle Dangerous*, ready for the press by the autumn of 1831. He would not yield to the solicitations of his friends and consent to try rest and a change of scene, till, fortunately, as his mental powers failed, he became possessed of the idea that all his debts were at last paid and that he was once more a free man. In this belief he happily remained till his death. When it was known that his physicians recommended a sea voyage for his health, a government vessel was put at his disposal, and he cruised about in the Mediterranean and visited places of interest for the greater part of a year before his death. But, when he felt that the end was near, he insisted on being carried across Europe that he might die on his beloved Tweedside at Abbotsford, where he expired on September 21, 1832. He was buried at Dryburgh Abbey on September 26th following.

SCOTT, WILLIAM. See STOWELL, LORD.

SCOTT, WINFIELD, American general, was born near Petersburg, Va., June 13, 1786, the grandson of a Scottish refugee from the field of Culloden. He was a student at William and Mary College in 1805, and was admitted to the bar at Richmond, Va., in 1807. One of the sudden war excitements of the time changed the course of his life, and he obtained a captain's commission in the United States army in 1808. He served on the Niagara frontier throughout the war of 1812–15, and became one of its leading figures, rising rapidly through all the grades of the service to that of major-general, which was then the highest. In 1841 he became senior major-general of the army, and in 1855, after he had passed out of political life, the exceptional grade of lieutenant-general was created for him. His most noteworthy military achievement was his conduct of the main campaign against Mexico in 1847. Landing (March 9th) at Vera Cruz with but 5,500 men, he fought his way through a hostile country to the capital city of Mexico, which he captured September 14th, thereby practically ending the war. His service, however, was not confined to the army; from 1815 until 1861 he was the most continuously prominent public man of the country, receiving and justifying every mark of public confidence in his integrity, tact, and reasonableness. At a time (1823) when dueling was almost an imperative duty of an officer, he resisted successfully the persistent efforts of a brother officer (Andrew Jackson) to force him into a combat; and the simple rectitude of his intentions was so evident that he lost no ground in public estimation. In 1832, when ordered to Charleston by President Jackson during the "nullification" troubles, he secured every advantage for the Government, while his skillful and judicious conduct gave no occasion to South Carolina for an outbreak. In like manner, in the Black Hawk Indian troubles of 1832–33, in the Canadian "Patriot War" of 1837–38, in the boundary dispute of 1838 between Maine and New Brunswick, in the San Juan difficulty in 1859, wherever there was imminent danger of war and a strong desire to keep the peace, all thoughts turned instinctively to Scott as a fit instrument of an amicable settlement, and his success always justified the choice. Such a career seemed a gateway to political preferment, and his position was strengthened by the notorious fact that, as he was a Whig, the Democratic administration had persistently tried to subordinate his claims to those of officers of its own party. In 1852 his party nominated him for the presidency; but, though his services had been so great and his capacity and integrity were beyond question, he had other qualities which counted heavily against him. He was easily betrayed into the most egregious blunders of speech and action, which drew additional zest from his portly and massive form and a somewhat pompous ceremoniousness of manner. He destroyed his chances of election in the North. The Southern Whigs, believing him to be under the influence of the Seward or anti-slavery wing of the party, cast no strong vote for him, and he was overwhelmingly defeated in both sections, completing the final overthrow of his party. In 1861 he remained at the head of the United States armies, in spite of the secession of his State, until November, when he retired on account of old age and infirmities. After traveling for a time in Europe, he published in 1864 his autobiography, a work which reveals the strong and weak points of his character, his integrity and complete honesty of purpose, his inclination to personal vanity, his rigid precision in every point of military precedent and etiquette, and his laborious affectation of an intimate acquaintance with *belles lettres*. He died at West Point, N. Y., May 29, 1866.

SCOTUS. See Duns Scotus and Scholasticism.

SCRANTON, a city of the United States, capital of Lackawanna county, Penn., on a plateau at the junction of the Roaring Brook and the Lackawanna river, 162 miles north of Philadelphia. It is the center of the great coal-mining district in the country, and the seat of a large number of iron and steel works, rolling-mills, blast-furnaces, etc., and extensive factories for the production of rails, locomotives, mining machinery, steam-boilers, stoves, carriages, edge-tools, etc. A public library, a theater, an academy of music, a hospital, a public hall, a driving park, a Roman Catholic cathedral, a home for the friendless, and a museum of Indian stone relics are among the more prominent features of the place. The population was 9,223 in 1860, 35,092 in 1870, 45,850 in 1880, and 75,215 in 1890.

Slocum Farm, as the site was called subsequent to 1798, saw its first blast-furnace erected in 1840 by George and Selden Scranton, who soon added a rolling-mill and the manufacture of rails. The opening of the railway in 1856 gave a great stimulus to the new town (1854), which obtained a city charter in 1866. It is divided into twenty-one wards, of which the fourth, fifth, sixth, fourteenth, fifteenth, and eighteenth are known as Hyde Park, the first, second, and third as Providence.

SCREAMER, a bird inhabiting Guiana and the Amazon valley, so called in 1781 by Pennant "from the violent noise it makes"—the *Palamedea cornuta* of Linnæus. First made known in 1648 by Marcgrave under the name of *Anhima*, it was more fully described and better figured by Buffon under that of *Kamichi*, still applied to it by French writers. Of about the size of a Turkey, it is remarkable for the curious "horn" or slender caruncle, more than three inches long, it bears on its crown, the two sharp spurs with which each wing is armed, and its elongated toes. Its plumage is plain in color, being of an almost uniform grayish black above, the space round the eyes and a ring round the neck being variegated with white, and a patch of pale rufous appearing above the carpal joint, while the lower parts of the body are white. A most singular habit possessed by this bird is that of rising in the air and soaring there in circles at an immense altitude, uttering at intervals the very loud cry of which its local name is an imitation. From a dozen to a score may be seen at once so occupying themselves.

SCREW. The screw is the simplest instrument for converting a uniform motion of rotation into a uniform motion of translation. Metal screws requiring no special accuracy are generally cut by taps and dies. A tap is a cylindrical piece of steel having a screw on its exterior with sharp cutting edges; by forcing this with a revolving motion into a hole of the proper size, a screw is cut on its interior forming what is known as a nut or female screw. The die is a nut with sharp cutting edges used to screw upon the outside of round pieces of metal, and thus produce male screws. More accurate screws are cut in a lathe by causing the carriage carrying the tool to move uniformly forward: thus a continuous spiral line is cut on the uniformly revolving cylinder fixed between the lathe centers. The cutting tool may be an ordinary form of lathe tool or a revolving saw-like disk.

Making Accurate Screws.—To produce a screw of a foot, or even a yard long with errors not exceeding $\frac{1}{1000}$ of an inch is not difficult. Prof. William A. Rogers, of Harvard observatory, has invented a process in which the tool of the lathe while cutting the screw is moved so as to counteract the errors of the lathe screw. The screw is then partly ground to get rid of local errors. But, where the highest accuracy is needed, we must resort in the case of screws, as in all other cases, to grinding. A long solid nut, tightly fitting the screw in one position, cannot be moved freely to another position unless the screw is very accurate. If grinding material is applied and the nut is constantly tightened, it will grind out all errors of run, drunkenness, crookedness, and irregularity of size. The condition is that the nut must be long, rigid, and capable of being tightened as the grinding proceeds; also the screw must be ground longer than it will finally be needed, so that the imperfect ends may be removed.

Suppose it is our purpose to produce a screw which is finally to be nine inches long, not including bearings, and one and one-eighth inches in diameter. Select a bar of soft Bessemer steel, which has not the hard spots usually found in cast steel, about one and three-eighths inches in diameter, and thirty long. Put it between lathe centers and turn it down to one inch diameter everywhere, except about twelve inches in the center, where it is left a little over one and one-eighth inches in diameter for cutting the screw. Now cut the screw with a triangular thread a little sharper than 60°. Above all, avoid a fine screw, using about twenty threads to the inch.

SCRIBE, Augustin Eugène, the most popular playwright of France, was born at Paris on December 24, 1791, and died there on February 20, 1861.

SCRIBES. See Israel.

SCRIVENER'S PALSY. A species of cramp

SCROFULA or Struma (formerly known in England as "king's evil," from the belief that the touch of the sovereign could effect a cure), a constitutional morbid condition generally exhibiting itself in early life, and characterized mainly by defective nutrition of the tissues and by a tendency to inflammatory affections of a low type with degenerative changes in their products. Scrofula may be either inherited or acquired. Heredity is of all causes the most potent, and naturally operates with greater certainty where both parents possess the taint. As in all hereditary diseases, however, the liability may be scarcely perceptible for one or two generations, but may then reappear. Other causes referable to parentage may readily produce this constitutional state in children, as weakness or ill health in one or both parents, and, as seems probable, marriages of consanguinity. But, apart altogether from hereditary or congenital influences, the scrofulous habit is frequently developed, especially in the young, by such unfavorable hygienic conditions as result from overcrowded, cold, and dark dwellings, insufficient and improper food, exposure, and debauchery. Even among the old in such circumstances the evidences of scrofula may be seen to present themselves where before they had been absent.

Scrofula may, under favorable circumstances, tend to improvement as age advances, and it occasionally happens that persons who in early life showed unmistakable evidences of this condition appear ultimately to outgrow it, and become in all respects healthy and vigorous. The treatment is essentially similar to that described for rickets or phthisis, and is partly preventive and partly curative. It consists mainly in hygienic measures to promote the health and nutrition of the young, and of suitable diet, tonics, etc., where evidences of the disease have declared themselves.

SCRUB-BIRD, the name (for want of a better, since it is not very distinctive) conferred upon the two species (*Atrichia clamosa* and *Atrichia rufescens*) of an Australian genus, one of the most curious ornithological types of the many furnished by that country. Both the known species of Scrub-bird are about the size of a small Thrush—*A. clamosa* being the larger of the two. This species is brown above, each feather barred with a darker shade; the throat and belly are reddish white, and there is a large black patch on the breast; while the flanks are brown and the lower tailcoverts rufous. *A. rufescens* has the white and black of the fore-parts replaced by brown, barred much as is the upper plumage. Both species are said to inhabit the thickest "scrub" or brushwood forest; but little has been ascertained as to their mode of life except that the males are noisy, imitative of the notes of other birds, and given to violent gesticulations. The nest and eggs seem never to have been found, and indeed no example of the female of either species is known to have been procured, whence that sex may be inferred to escape observation by its inconspicuous appearance and retiring habits.

SCUDÉRY is the name of a family which is said to have been of Italian origin and to have transferred itself to Provence, but which is only known by the singular brother and sister who represented it during the seventeenth century.

Georges de Scudéry the elder of the pair, was born in 1601, at Havre, whither his father had moved from Provence, in the same year. He served in the army for some time, and, though in the vein of gasconading which was almost peculiar to him he no doubt exaggerated his services, there seems little doubt that he was a stout soldier. But he conceived a fancy for literature before he was thirty, and during the whole of the middle of the century he was one of the most characteristic figures of Paris, in which city he died May 14, 1667.

His sister Madeleine, who was born also at Havre, in 1607, was a writer of much more ability and of a much better regulated character. She was very plain and had no fortune, but her abilities were great and she was very well educated. Establishing herself at Paris with her brother, she was at once admitted to the Rambouillet coterie, afterward established a salon of her own under the title of the *Société du Samedi*, and for the last half of the seventeenth century, under the pseudonym of "Sapho" or her own name, was acknowledged as the first blue-stocking of France, and of the world. Her celebrated novels, *Artamène ou le Grand Cyrus*, *Clélie*, *Ibrahim ou l'Illustre Bassa*, *Almahide*, and others are known by quotation to every one, and were the delight of all Europe, including persons of the wit and sense of Madame de Sévigné. She never lost either her renown or her wits or her good sense, and died at Paris on June 2, 1701.

SCULPTURE. The present article is confined to the sculpture of the Middle Ages and modern times.

In the fourth century A.D., under the rule of Constantine's successors, the plastic arts in the Roman world reached the lowest point of degradation to which they ever fell. Coarse in workmanship, intensely feeble in design, and utterly without expression or life, the pagan sculpture of that time is merely a dull and ignorant imitation of the work of previous centuries. The old faith was dead, and the art which had sprung from it died with it. In the same century a large amount of sculpture was produced by Christian workmen, which, though it reached no very high standard of merit, was at least far superior to the pagan work. Although it shows no increase of technical skill or knowledge of the human form, yet the mere fact that it was inspired and its subjects supplied by a real living faith was quite sufficient to give it a vigor and a dramatic force which raise it æsthetically far above the expiring efforts of paganism. We give a copy of a fine Christian relief of the fourth century, with a noble figure of an archangel holding an orb and a scepter.

In the fifth century other plastic works similar in style were still produced in Italy, especially reliefs in ivory (to a certain extent imitations of the latter consular diptychs), which were used to decorate episcopal thrones or the bindings of MSS. of the Gospels. The so-called chair of St. Peter, still preserved (though hidden from sight) in his great basilica, is the finest example of the former class.

In the sixth century, under the Byzantine influence of Justinian, a new class of decorative sculpture was produced, especially at Ravenna. Subject reliefs do not often occur, but large slabs of marble, forming screens, altars, pulpits, and the like, were ornamented in a very skillful and original way with low reliefs of graceful vine plants, with peacocks and other birds drinking out of chalices, all treated in a very able and highly decorative manner.

Till about the twelfth century, and in some places much later, the art of Byzantium dominated that of the whole Christian world in a very remarkable way. From Russia to Ireland and from Norway to Spain any given work of art in one of the countries of Europe might almost equally well have been designed in any other. Little or no local peculiarities can be detected,

PAINTING AND SCULPTURE.

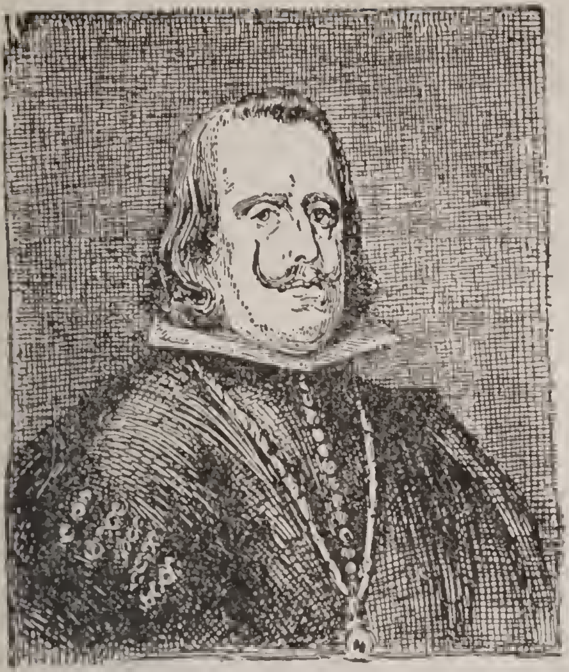


FIG. 37.—Portrait of Philip IV. of Spain, by Velazquez. (National Gallery.)

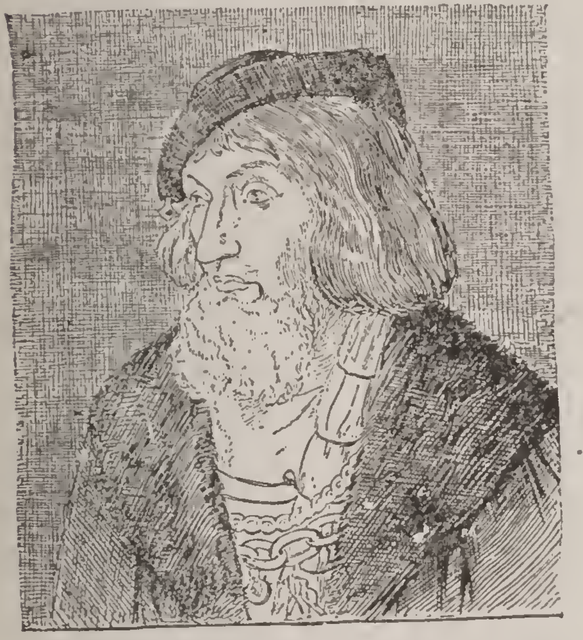


FIG. 26 —Portrait of a Senator, by Albert Durer. (National Gallery.)

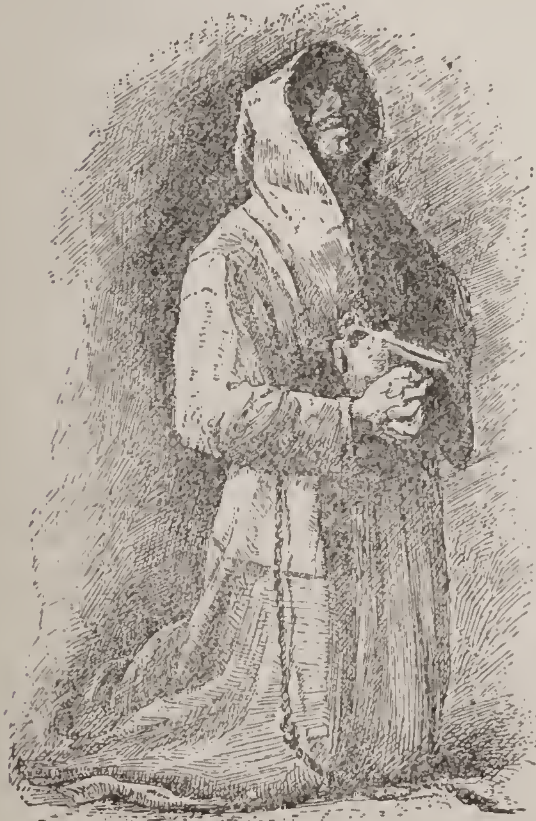
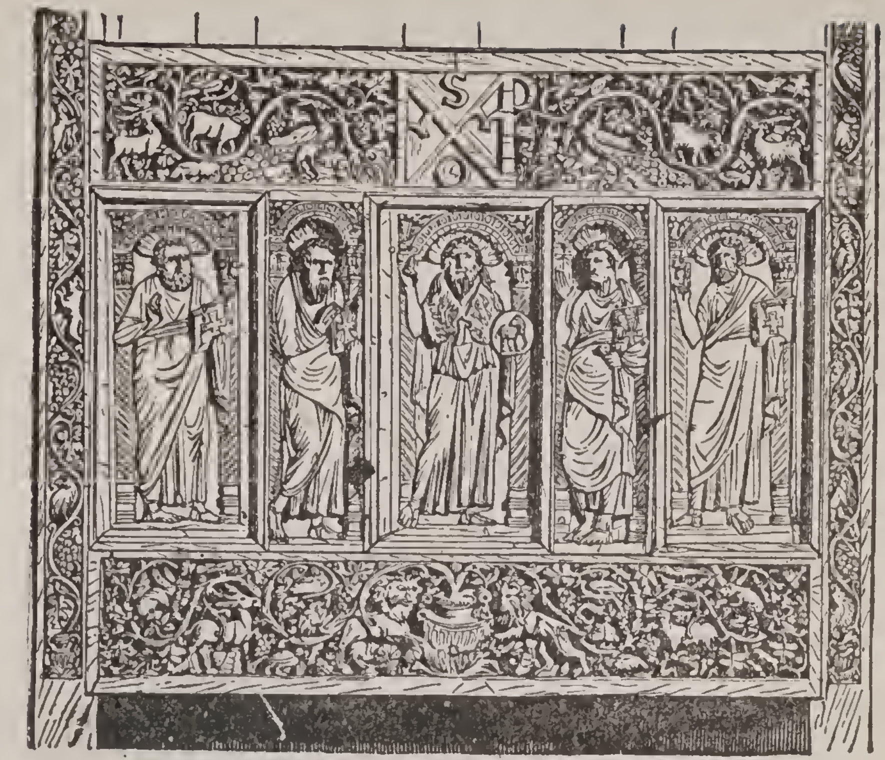
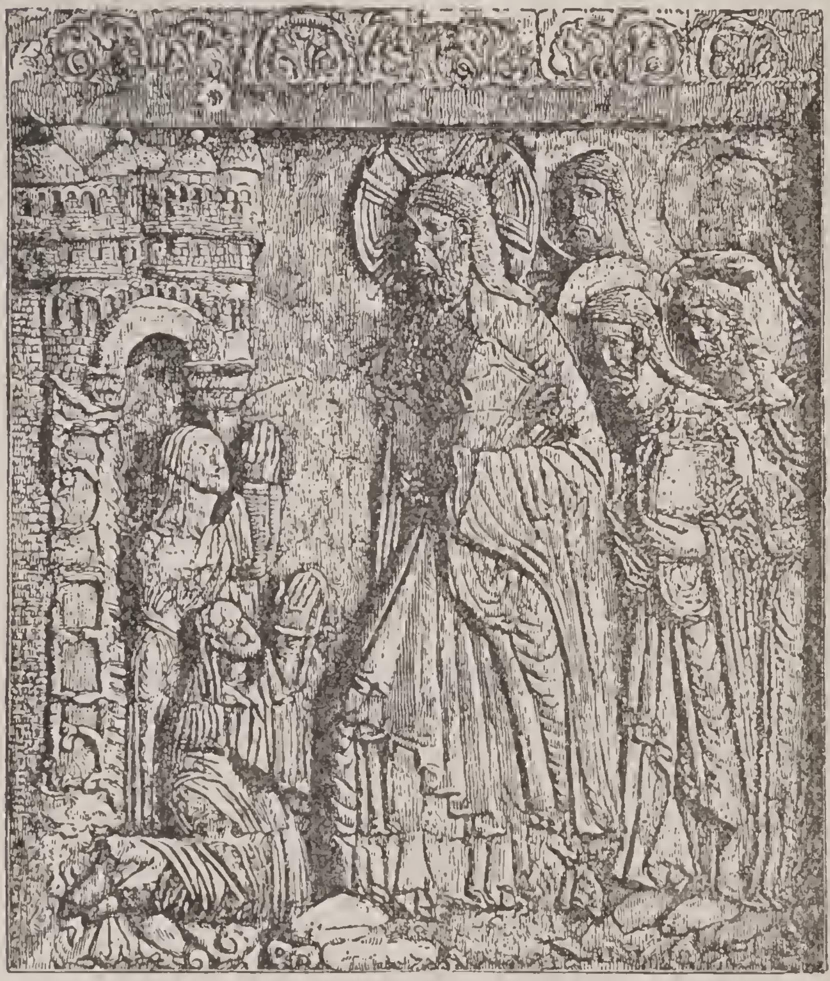


FIG. 36.—Franciscan Friar, by Zurbaran. (National Gallery.)



Reliefs in Ivory of the Baptist and the Four Evangelists in front of the episcopal throne of Maximianus in Ravenna cathedral.



Relief of Christ at the tomb of Lazarus, now in Chichester cathedral: 11th century, Byzantine style.

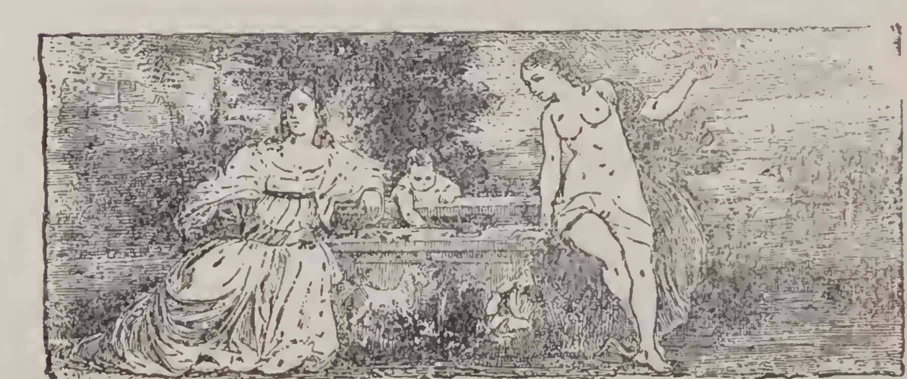


FIG. 16.—So-called Sacred and Profane Love, by Titian. (Borghese Gallery, Rome.)

PAINTINGS.

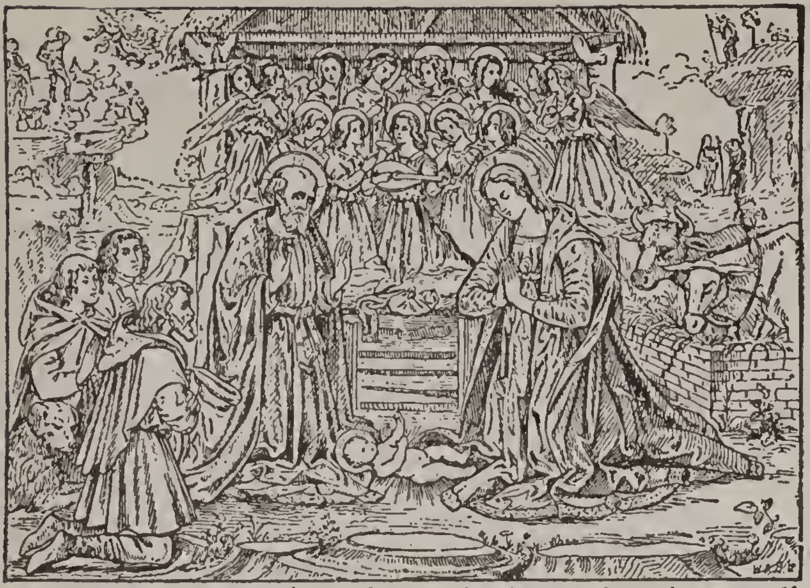


Fig. 11.—The Adoration of the Shepherds, by Fiorenzo di Lorenzo. (Gallery at Perugia.)

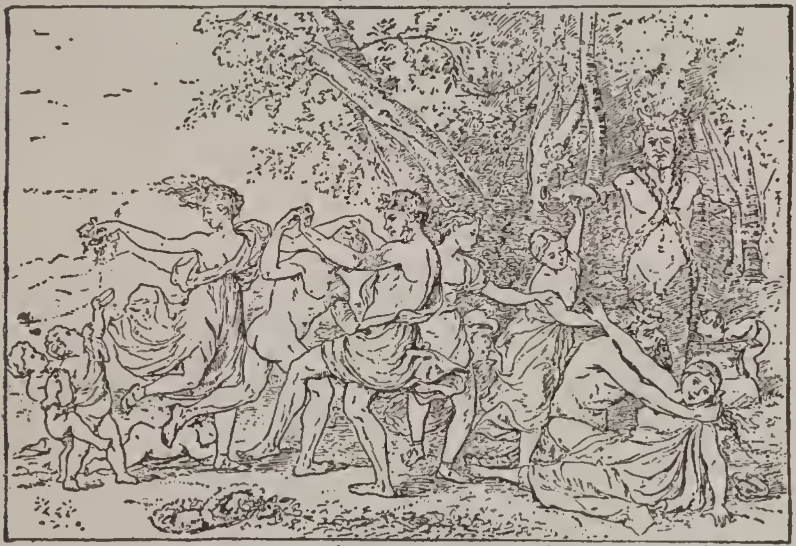


Fig. 38.—Bacchanalian Scene, by Nicolas Poussin. (National Gallery.)

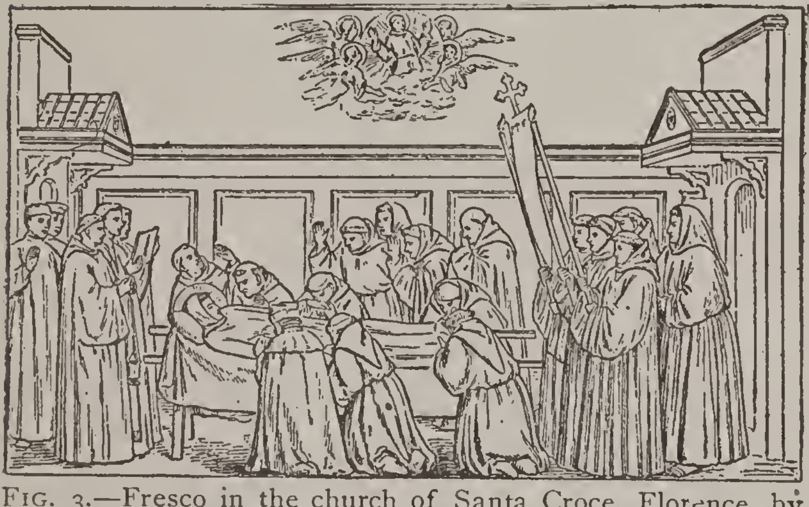


Fig. 3.—Fresco in the church of Santa Croce, Florence, by Giotto—the Disciples of St. Francis discovering the Stigmata on his Body.

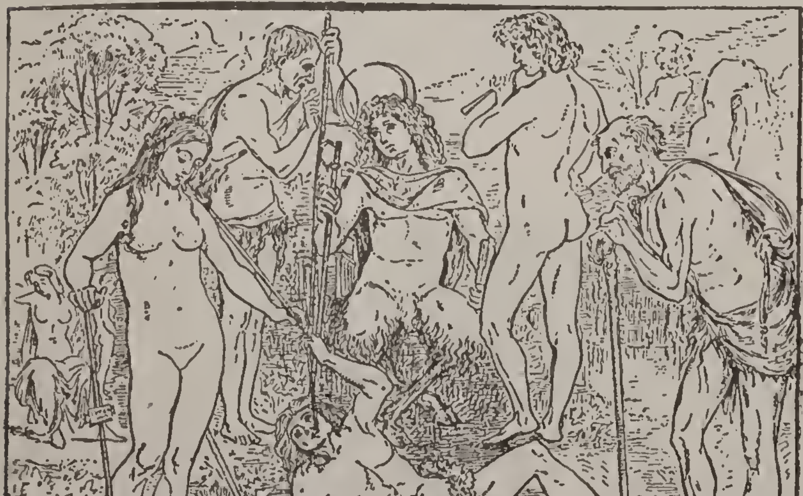


Fig. 8.—The so-called School of Pan, by Signorelli, the most beautiful of his easel pictures. (Berlin Gallery.)

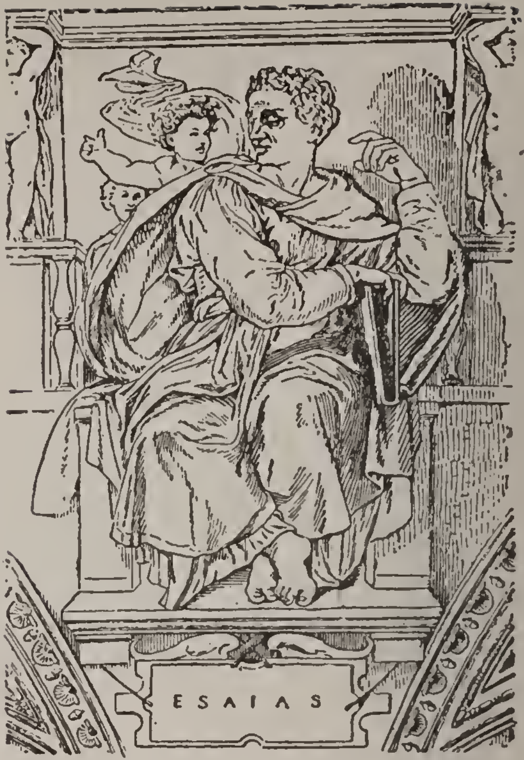


Fig. 9.—Fresco of Isaiah, by Michelangelo, from the vault of the Sistine Chapel.

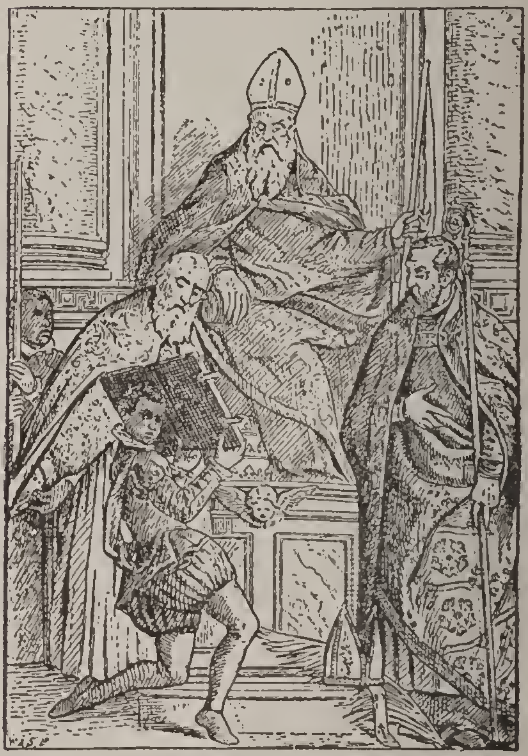


Fig. 17.—Various Saints, by Paul Veronese. (Brera Gallery, Milan.)

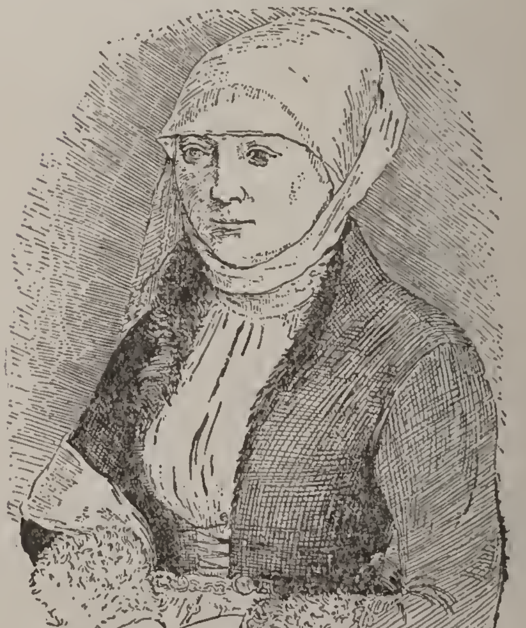


Fig. 27.—Portrait of an Unknown Lady by Holbein. (The Hague Gallery.)

except of course in the methods of execution, and even these were wonderfully similar everywhere.

The extensive use of the precious metals for the chief works of plastic art in this early period is one of the reasons why so few examples still remain—their great intrinsic value naturally causing their destruction. One of the most important existing examples, dating from the eighth century, is a series of colossal wall reliefs executed in hard stucco in the church of Cividale (Friuli) not far from Trieste.

It will be convenient to discuss the sculpture of the mediæval and modern periods under the heads of the chief countries of Europe.

England.—During the Saxon period, when stone buildings were rare and even large cathedrals were built of wood, the plastic arts were mostly confined to the use of gold, silver, and gilt copper. The earliest existing specimens of sculpture in stone are a number of tall churchyard crosses, mostly in the northern provinces and apparently the work of Scandinavian sculptors. One very remarkable example is a tall monolithic cross, cut in sandstone, in the churchyard of Gosforth in Cumberland. Of special interest from their early date—probably the eleventh century—are two large stone reliefs now in Chichester cathedral, which are traditionally said to have come from the pre-Norman church at Selsey. They are thoroughly Byzantine in style, but evidently the work of some very ignorant sculptor.

During the Norman period sculpture of a very rude sort was much used, especially for the tympanum reliefs over the doors of churches.

The best preserved examples of monumental sculpture of the twelfth century are a number of effigies of knights-templars in the round Temple church in London. They are laboriously cut in hard Purbeck marble, and much resemble bronze in their treatment.

Much of the fine thirteenth century sculpture was used to decorate the façades of churches. The grandest example is the west end of Wells cathedral, of about the middle of the century. It is covered with more than 600 figures in the round or in relief, arranged in tiers, and of varying sizes.

Peterborough, Lichfield and Salisbury cathedrals have fine examples of the sculpture of the thirteenth century; in the chapter-house of the last the spandrels of the wall-arcade are filled with sixty reliefs of subjects from Bible history, all treated with much grace and refinement. To the end of the same century belong the celebrated reliefs of angels in the spandrels of the choir arches at Lincoln, carved in a large massive way with great strength of decorative effect. Other fine reliefs of angels, executed about 1260, exist in the transepts of Westminster Abbey; being high from the ground, they are broadly treated without any high finish in the details.

In England purely decorative carving in stone reached its highest point of excellence about the middle of the fourteenth century—rather later, that is, than the best period of figure sculpture. WOOD-CARVING (*q.v.*), on the other hand, reached its artistic climax a full century later under the influence of the fully developed Perpendicular style.

The most important effigies of the fourteenth century are those in gilt bronze of Edward III. (d. 1377) and of Richard II. and his queen (made in 1395), all at Westminster. The finest piece of bronze sculpture of the fifteenth century is the effigy of Richard Beauchamp (d. 1439) in his family chapel at Warwick—a noble portrait figure, richly decorated with engraved ornaments. At the beginning of the sixteenth century sculpture in England was entering upon a period of rapid decadence, and to some extent had lost its native individuality. The finest series of statues of this period are those of life-size high up on the walls of Henry VII.'s chapel at Westminster and others over the various minor altars. This decadence of English sculpture caused Henry VII. to invite the Florentine Torrigiano (1472?-1522) to come to England to model and cast the bronze figures for his own magnificent tomb, which still exist in almost perfect preservation.

During the troublous times of the Reformation, sculpture, like the other arts, continued to decline. Of seventeenth-century monumental effigies that of Sir Francis Vere (who died in 1607) in the north transept at Westminster is one of the best, though its design—a recumbent effigy overshadowed by a slab covered with armor, upborne by four kneeling figures of men-at-arms—is almost an exact copy of the tomb of Engelbert II. of Vianden-Nassau. The finest bronze statues of this century are those of George Villiers, duke of Buckingham (who died in 1628), and his wife, at the northeast of Henry VII.'s chapel.

During the eighteenth century English sculpture was mostly in the hands of Flemish and other foreign artists, of whom Roubiliac (1695-1762), Sheemakers (1691-1773), and Rysbrack (1694-1770) were the chief. The ridiculous custom of representing Englishmen of the eighteenth and nineteenth centuries in the toga or in the armor of an ancient Roman was fatal alike to artistic merit and to eikonic truth; and when, as was often the case, the periwig of the Georgian period was added to the costume of a Roman general, the effect was supremely ridiculous.

During the first half of the nineteenth century the prevalence of a cold, lifeless, pseudo-classic style was fatal to individual talent, and robbed the sculpture of England of all real vigor and spirit. Francis Chantrey (1782-1841) produced a great quantity of sculpture, especially sepulchral monuments, which were much admired in spite of their very limited merits. Allen Cunningham and Henry Weekes worked in some cases in conjunction with Chantrey, who was not wanting in technical skill, as is shown by his clever marble relief of two dead woodcocks. John Gibson (1790-1866) was perhaps after Flaxman the most successful of the English classic school, and produced some works of real merit.

During the last hundred years a large number of honorary statues have been set up in the Houses of Parliament, Westminster Hall and Abbey, and in other public places in London. Most of these, though modeled as a rule with some scholastic accuracy, are quite dull and spiritless, and, while free from the violently bad taste of such men as Bernini or Roubiliac, they lack the force and vigorous originality which go far to redeem what is offensive in the sculpture of the seventeenth and eighteenth centuries. The modern public statues of London and elsewhere are as a rule tamely respectable and quite uninteresting. One brilliant exception is the Wellington monument in St. Paul's Cathedral, probably the finest plastic work of modern times. It was the work of Alfred Stevens (1817-1875), a sculptor of the highest talent, who lived and died almost unrecognized by the British public.

In the present generation there are some signs of the development of a better state of the plastic arts. A bronze statue of an Athlete struggling with a Python, by Sir Frederick Leighton, is a work of great merit, almost worthy to rank with the best examples of any period, and remarkable for a profound knowledge of human anatomy.

France.—During the twelfth and thirteenth centuries the sculpture of France was, on the whole, the finest in the world, and was there used in the greatest profusion. The façades of large cathedrals were completely covered with sculptured reliefs and thick-set rows of statues in niches. The whole of the front was frequently one huge composition of statuary, with only sufficient purely architectural work to form a background and frame for the sculptured figures. A west end treated like that of Wells cathedral, which is almost unique in England, is not uncommon in France.

In France, as in England, the thirteenth century was the golden age of sculpture; while still keeping its early dignity and subordination to its architectural setting, the sculpture reached a very high degree of graceful finish and even sensuous beauty. Nothing could surpass the loveliness of the angel statues round the Parisian Sainte Chapelle, and even the earlier work on the façade of Laon cathedral is full of grace and delicacy. Amiens cathedral is especially rich in sculpture of this date—as, for example, the noble and majestic statues of Christ and the Apostles at the west end; the sculpture on the south transept of about 1260–70, of more developed style, is remarkable for dignity combined with soft beauty. The noble row of kings on the west end of Notre Dame at Paris has, like the earlier sculpture, been ruined by "restoration," which has robbed the statues of both their spirit and their vigor. To the latter years of the thirteenth century belongs the magnificent series of statues and reliefs round the three great western doorways of the same church, among which are no less than thirty-four life-sized figures. On the whole, the single statues throughout this period are finer than the reliefs with many figures.

In the fourteenth century French sculpture began to decline, though much beautiful plastic work was still produced. Some of the reliefs on the choir screen of Notre Dame at Paris belong to this period, as does also much fine sculpture on the transepts of Rouen cathedral and the west end of Lyons. At the end of this century an able sculptor from the Netherlands, called Claux Sluter, executed much fine work, especially at Dijon, under the patronage of Philip the Bold.

The latter part of the fifteenth century in France was a time of transition from the mediæval style, which had gradually been deteriorating, to the more florid and realistic taste of the Renaissance. To this period belong a number of rich reliefs and statues on the choir-screen of Chartres cathedral. Those on the screen at Amiens are later still, and exhibit the rapid advance of the new style.

In the sixteenth century Italian influence, especially that of Benvenuto Cellini, was paramount in France. Jean Goujon, who died in 1572, was the ablest French sculptor of the time; he combined great technical skill and refinement of modeling with the florid and affected style of the age.

No sculptor of any great merit appears to have arisen in France during the seventeenth century, though some, such as the two Coustous, had great technical skill. Pierre Puget (1622–1694) produced vigorous but coarse and tasteless work, such as his *Milo devoured by a Lion*. Other sculptors of the time were Simon Guillain, François and Michael Anguier, and Chas. Ant. Coyzevox (1640–1720), the last a sculptor of Lyons who produced some fine portrait busts.

In the following century Jean Antoine Houdon (1740–1828), a sculptor of most exceptional power, produced some works of the highest merit at a time when the plastic arts had reached a very low ebb. His standing colossal statue of S. Bruno in S. Maria degli Angeli at Rome is a most noble and stately piece of portraiture, full of commanding dignity and expression. His seated statue of Voltaire in the *foyer* of the Théâtre Français, though sculpturesque in treatment, is a most striking piece of lifelike realism. Houdon may in fact be regarded as the precursor of the modern school of French sculpture of the better sort. Among the first sculptors of this school were Antoine Chaudet (1763–1810) and Joseph Bosio (1769–1845). The latter was largely employed by Napoleon I.: he executed with some ability the bronze spiral reliefs round the column of the Place Vendôme and the statue of Napoleon on the top, and also modeled the classical quadriga on the triumphal arch in the Place du Carrousel. Jacques Pradier of Geneva (1790–1852) produced the *Chained Prometheus* of the Louvre and the Niobe group (1822). He possessed great technical ability, but aimed in most of his works at a soft sensuous beauty which is specially unsuited to sculpture. François Rude (1784–1855) worked in a style modeled on Græco-Roman sculpture treated with some freedom. His bronze *Mercury* in the Louvre is a clever work, but his statues of Marshal Ney in the Luxembourg Gardens and of General Cavaignac (1847) in the cemetery of Montmartre are conspicuously bad. The reliefs on the pediment of the Panthéon are by Pierre Jean David of Angers (1789–1856); his early works are of dull classic style, but later in life he became a realist and produced the most unsculpturesque results. A bronze statue of a *Dancing Fisher-lad* modeled by François Joseph Duvet, now in the Luxembourg collection, is an able work of the *genre* class. Other French sculptors who were highly esteemed in their time were Ottin, Courtet, Simart, Etex, and Carpeaux. The last was an artist of great ability, and produced an immense number of clever but often very offensive statues. He obtained the highest renown in France, and was a typical example of the sad degradation of taste which prevailed under the rule of Napoleon III.

The existing schools of French sculpture are by far the most important in the world. Technical skill and intimate knowledge of the human form are possessed by several living sculptors of France to a degree which has probably never been surpassed, and some of them produce works of very great power, beauty, and originality. Many of their works have a similar fault to that of one class of French painters; they are much injured by an excess of sensual realism; in many cases nude statues are simply life-studies with all the faults and individual peculiarities of one model.

Germany.—Till the twelfth century sculpture in Germany continued to be under the lifeless influence of Byzantium, tempered to some extent by an attempt to return to classical models. This is seen in the bronze pillar reliefs and other works produced by Bishop Bernward after his visit to Rome. Hildesheim, Cologne, and the whole of the Rhine provinces were the most active seats of German sculpture, especially in metal, till the twelfth century. In the thirteenth century German sculpture had made considerable artistic progress, but it did not reach the high standard of France. One of the best examples is the "golden gate" of Freiburg cathedral, with sculptured figures on the jambs after the French fashion. The statues of the apostles on the nave pillars, and especially one of the Madonna at the east end (1260–70), possess great beauty and sculpturesque breadth.

Nuremberg is rich in good sculpture of the fourteenth century. The church of St. Sebald, the Frauenkirche, and the west façade of St. Lawrence are lavishly decorated with reliefs and statues, very rich in effect, but showing the germs of that mannerism which grew so strong in Germany during the fifteenth century. Of special beauty are the statuettes which adorn the "beautiful fountain," executed by Heinrich der Balier

SCULPTURE.

Bronze colossal statue of Colleoni at Venice, modeled by Verrocchio and cast by Leopardi.

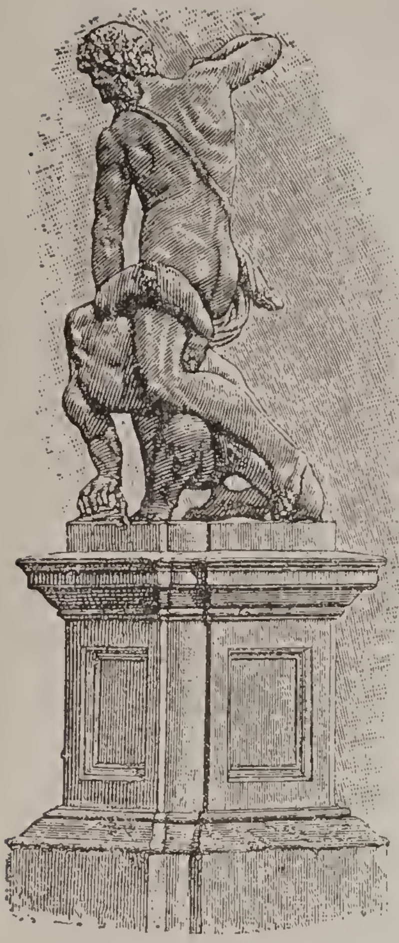
Bronze statue of an athlete and python, by Sir Frederick Leighton, P. R. A., in the South Kensington Museum.

Head of the effigy of Queen Eleanor in Westminster Abbey bronze gilt, by William Torell.

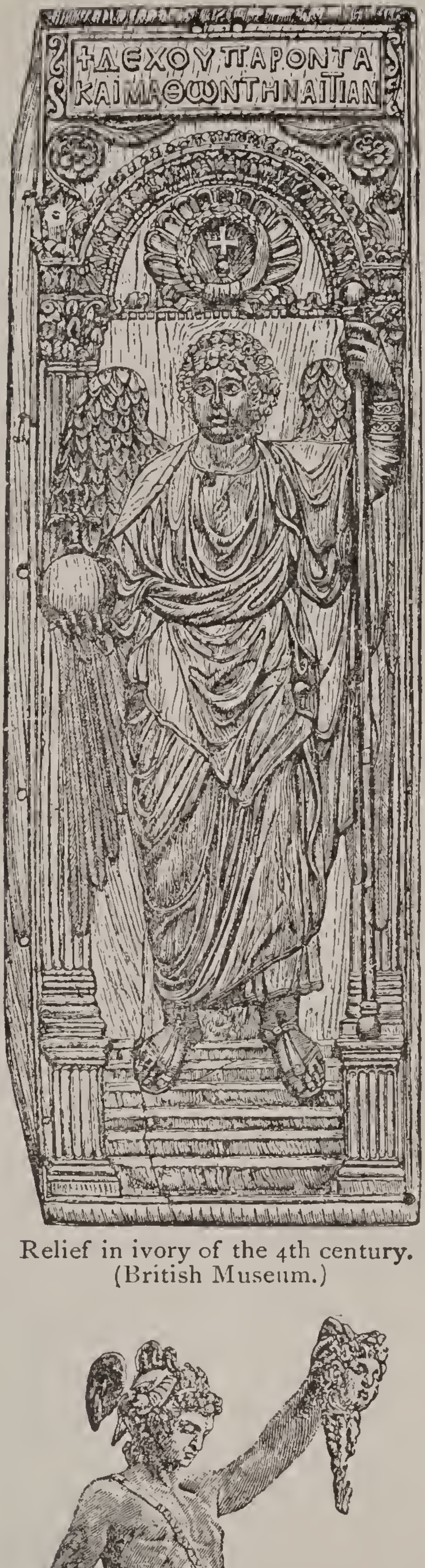
Colossal marble group of Theseus and a centaur, by Canova. at Vienna.

Bronze group by Alfred Stevens from the Wellington monument.

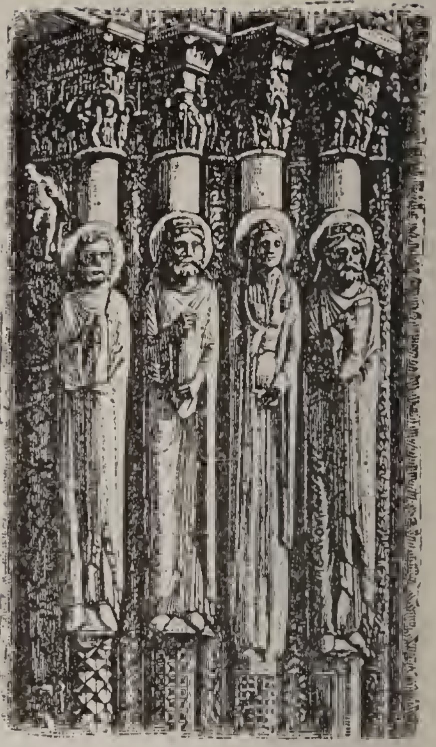
SCULPTURE.



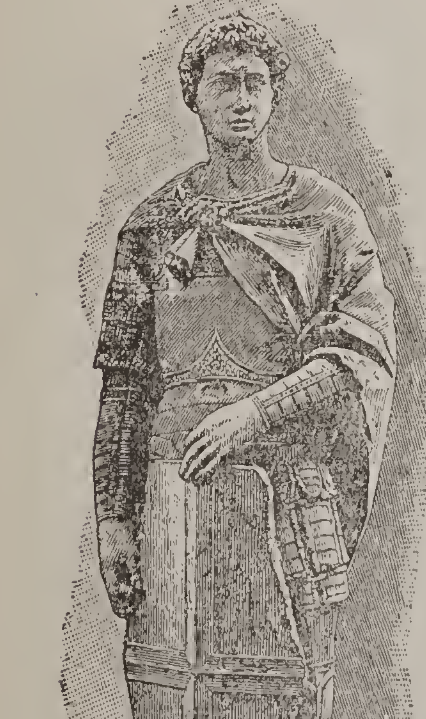
Group by Giovanni da Bologna, formerly in Brasenose College, Oxford; destroyed in 1881.



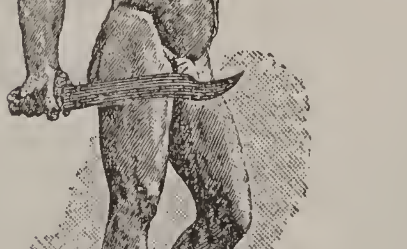
Relief in ivory of the 4th century. (British Museum.)



Statues on jamb of central west door of Chartres cathedral, 12th century; specially designed to suit vertical lines of columns behind; all once covered with painting and gold.



Statue of St. George by Donatello, outside the church of Or San Michele at Florence.



Bronze statue of Perseus and Medusa by Cellini, in the Loggia de' Lanzi at Florence.

(1385–1396), and richly decorated with gold and color by the painter Rudolph. A number of colossal figures were executed for Cologne cathedral between 1349 and 1361, but they are of no great merit. Augsburg produced several sculptors of ability about this time, and the museum possesses some very noble wooden statues of this school, large in scale and dignified in treatment.

The fifteenth century was one of great activity and originality in the sculpture of Germany and produced many artists of high ability. One specialty of the time was the production of an immense number of wooden altars and reredoses, painted and gilt in the most gorgeous way and covered with subject-reliefs and statues, the former often treated in a very pictorial style. Wooden screens, stalls, tabernacles, and other church-fittings of the greatest elaboration and clever workmanship were largely produced in Germany at the same time, and on into the sixteenth century.

The Vischer family, of Nuremberg, for three generations were among the ablest sculptors in bronze during the fifteenth and sixteenth centuries. Hermann Vischer the elder worked mostly between 1450 and 1505, following the earlier mediæval traditions, but without the originality of his son. Among his existing works the chief are the bronze font at Wittenberg church (1457) and four episcopal effigies in relief, dated from 1475 to 1505, in Bamberg cathedral; this church also contains a fine series of bronze sepulchral monuments of various dates throughout the fifteenth and sixteenth centuries. Hermann's son, Peter Vischer, was the chief artist of the family; he was admitted a master in the sculptor's guild in 1489, and passed the greater part of his life at Nuremberg, where he died in 1529. In technique few bronze sculptors have ever equaled him; but his designs are marred by an excess of mannered realism and a too exuberant fancy.

Next to Nuremberg, the chief centers of bronze sculpture were Augsburg and Lübeck. Innsbruck possesses one of the finest series of bronze statues of the first half of the sixteenth century, namely, twenty-eight colossal figures round the tomb of the emperor Maximilian, which stands in the center of the nave, representing a succession of heroes and ancestors of the emperor. The first of the statues which was completed cost 3,000 florins, and so Maximilian invited the help of Peter Vischer, whose skill was greater and whose work less expensive than that of the local craftsmen. Most of them, however, were executed by sculptors of whom little is now known.

In the latter part of the sixteenth century the influence of the later Italian Renaissance becomes very apparent, and many elaborate works in bronze were produced, especially at Augsburg, where Hubert Gerhard cast the fine *Augustus fountain* in 1593, and Adrian de Vries made the *Hercules fountain* in 1599; both were influenced by the style of Giovanni di Bologna, as shown in his magnificent fountain at Bologna.

In the following century Andreas Schlüter of Hamburg (born about 1662) produced smaller bronze reliefs and accessories of great merit. His colossal statue of Frederick III. on the bridge at Berlin is less successful. On the whole the seventeenth and eighteenth centuries in Germany, as in England, were periods of great decadence in the plastic art; little of merit was produced, except some portrait figures. In the second half of the eighteenth century there was a strong revival in sculpture, especially in the classic style, and since then Germany has produced an immense quantity of large and pretentious sculpture, mostly dull in design and second-rate in execution. The bad taste of the first half of the present century is strongly shown by many of the works of Theodore Kalidé, whose Bacchanal sprawling on a Panther's Back is a marvel of awkwardness of pose and absence of any feeling for beauty. Rietschel was perhaps the best German sculptor of this period, and produced work superior to that of his contemporaries. Some revival of a better style is shown in some sculpture, especially reliefs, by Hähnel, whose chief works are at Dresden. Schwanthaler (1802–1848), who was largely patronized by King Louis of Bavaria, studied at Rome and was at first a feeble imitator of antique classic art, but later in life he developed a more romantic and pseudo-mediæval style. By him are a large number of reliefs and statues in the Glyptothek at Munich and in Walhalla, also the colossal but feeble bronze statue of Bavaria, in point of size one of the most ambitious works of modern times. Since the beginning of the second half of the century the sculpture of Germany has made visible progress, and several living artists have produced works of merit and originality, far superior to the feeble imitations of classic art which for nearly a century destroyed all possible vigor and individuality in the plastic productions of most European countries.

Spain.—In the early mediæval period the sculpture of northern Spain was much influenced by contemporary art in France. From the twelfth to the fourteenth century many French architects and sculptors visited and worked in Spain. The cathedral of Santiago de Compostella possesses one of the grandest existing specimens in the world of late twelfth century architectonic sculpture; this, though the work of a native artist, Mastei Mateo, is thoroughly French in style; as recorded by an inscription on the front, it was completed in 1188.

In the fourteenth century the silversmiths of Spain produced many works of sculpture of great size and technical power. One of the finest, by a Valencian called Peter Bernec, is the great silver retable at Gerona cathedral. It is divided into three tiers of statuettes and reliefs, richly framed in canopied niches, all of silver, partly cast and partly hammered.

In the fifteenth century an infusion of German influence was mixed with that of France, as may be seen in the very rich sculptural decorations which adorn the main door of Salamanca cathedral, the façade of S. Juan at Valladolid, and the church and cloisters of S. Juan de los Reyes at Toledo, perhaps the most gorgeous examples of architectural sculpture in the world. The carved foliage of this period is of especial beauty and spirited execution; realistic forms of plant-growth are mingled with other more conventional foliage in the most masterly manner.

In the early part of the sixteenth century a strong Italian influence superseded that of France and Germany, partly owing to the presence in Spain of the Florentine Torrigiano and other Italian artists.

Italy.—Till the great revival of plastic art took place in the middle of the thirteenth century, the sculpture of Italy was decidedly inferior to that of other more northern countries. Much of it was actually the work of northern sculptors—as, for example, the very rude sculpture on the façade of S. Andrea at Pistoia, executed about 1186 by Gruamons and his brother Adeodatus. After the thirteenth century the reverse was usually the case, and, as at the west end of Orvieto cathedral, the sculptured decorations are treated as being of primary importance—not that the Italian sculptor-architect ever allowed his statues or reliefs to weaken or damage their architectural surroundings, as is unfortunately the case with much modern sculpture. In southern Italy, during the thirteenth century, there existed a school of sculpture resembling that of France, owing probably to the Norman occupation. During the thirteenth century Rome and the central provinces of Italy produced very few sculptors of ability, almost the only men of note being the Cosmati.

During the fourteenth century Florence and the neighboring cities were the chief centers of Italian sculpture, and there numerous sculptors of successively increasing artistic power lived and worked, till in the fifteenth century Florence had become the æsthetic capital of the world, and reached a pitch of artistic wealth and perfection which Athens alone in its best days could have rivaled. The similarity between the plastic arts of Athens in the fifth or fourth century B.C. and of Florence in the fifteenth century is not one of analogy only. In the fourteenth century, in northern Italy, various schools of sculpture existed, especially at Verona and Venice, whose art differed widely from the contemporary art of Tuscany; but Milan and Pavia, on the other hand, possessed sculptors who followed closely the style of the Pisani. The chief examples of the latter class are the magnificent shrine of St. Augustine in the cathedral of Pavia, dated 1362, and the somewhat similar shrine of Peter the Martyr (1339), by Balduccio of Pisa, in the church of St. Eustorgio at Milan, both of white marble, decorated in the most lavish way with statuettes and subject reliefs. Many other fine pieces of the Pisan school exist in Milan.

Finally came Michelangelo, who raised the sculpture of the modern world to its highest pitch of magnificence, and at the same time sowed the seeds of its rapidly approaching decline; the head of his *David* is a work of unrivaled force and dignity. His rivals and imitators, Baccio Bandinelli, Giacomo della Porta, Montelupo, Ammanati, Vincenzo de' Rossi, and others, copied and exaggerated his faults without possessing a touch of his gigantic genius. In other parts of Italy, such as Pavia, the traditions of the century lasted longer, though gradually fading. Though for a long time in Italy great technical skill continued to exist, the vivifying spirit was dead, and at last a dull scholasticism or a riotous extravagance of design became the leading characteristics. The sixteenth century was one of transition to this state of degradation, but nevertheless produced many sculptors of great ability who were not wholly crushed by the declining taste of their time. John of Douay (1524–1608), usually known as Giovanni da Bologna, one of the ablest, lived and worked almost entirely in Italy.

The chief sculptor and architect of the sevententh century was the Neapolitan Bernini (1598–1680), who, with the aid of a large school of assistants, produced an almost incredible quantity of sculpture of the most varying degrees of merit and hideousness. His chief early group, the *Apollo and Daphne* in the Borghese casino, is a work of wonderful technical skill and delicate high finish, combined with soft beauty and grace, though too pictorial in style. In latter life Bernini turned out work of brutal coarseness, designed in a thoroughly unsculpturesque spirit.

In the next century at Naples Queirolo, Corradini, and Sammartino produced a number of statues, now in the chapel of S. Maria de' Sangri, which are extraordinary examples of wasted labor and ignorance of the simplest canons of plastic art. These are marble statues enmeshed in nets or covered with thin veils, executed with almost deceptive realism, perhaps the lowest stage of tricky degradation into which the sculptor's art could possibly fall. In the eighteenth century Italy was naturally the headquarters of the classical revival, which spread thence throughout most of Europe. Canova (1757–1822), a Venetian by birth, who spent most of his life in Rome, was perhaps the leading spirit of this movement, and became the most popular sculptor of his time. His work is very unequal in merit, mostly dull and uninteresting in style, and is occasionally marred by a meretricious spirit very contrary to the true classic feeling.

Scandinavia, etc.—By far the greatest sculptor of the classical revival was Bertel Thorwaldsen (1770–1844), an Icelander by race, whose boyhood was spent at Copenhagen, and who settled in Rome in 1797, when Canova's fame was at its highest point. He produced an immense quantity of groups, single statues, and reliefs, chiefly Greek and Roman deities, many of which show more of the true spirit of antique art than has been attained by any other modern sculptor.

Within recent years Russia, Poland, and other countries have produced many sculptors, most of whom belong to the modern German or French schools. Rome is still a favorite place of residence for the sculptors of all countries, but can hardly be said to possess a school of its own. The sculptors of America almost invariably study at one of the Great European centers of plastic art, especially in Paris. Hiram Powers of Cincinnati, who produced one work of merit, a nude female figure, called the Greek Slave, exhibited in London in 1851, lived and worked in Florence. Edward S. Valentine of Richmond, Va., also studied in Europe. His best work is probably the recumbent effigy of Gen. R. E. Lee at Lexington, Va. A number of living American sculptors now reside both in Florence and in Rome.

For the execution of a marble statue the sculptor first models a preliminary sketch on a small scale in clay or wax. He then, in the case of a life-sized or colossal statue, has a sort of iron skeleton set up, with stout bars for the arms and legs, fixed in the pose of the future figure. This is placed on a stand with a revolving top, so that the sculptor can easily turn the whole model round and thus work with the light on any side of it. Over this iron skeleton well-tempered modeling-clay is laid and is modeled into shape by the help of wood and bone tools; without the ironwork a soft clay figure, if more than a few inches high, would collapse with its own weight and squeeze the lower part out of shape. While the modeling is in progress it is necessary to keep the clay moist and plastic by squirting water on it with a sort of garden syringe capped with a finely perforated rose. When the sculptor is not at work the whole figure is kept wrapped up in damp cloths. A modern improvement is to mix the modeling-clay, not with water, but with stearine and glycerine; this, while keeping the clay soft and plastic, has the great advantage of not being wet, and so the sculptor avoids the chill and consequent risk of rheumatism which follow from a constant manipulation of wet clay. When the clay model is finished it is cast in plaster. A "piece-mold" is formed by applying patches of wet plaster of Paris all over the clay statue in such a way that they can be removed piecemeal from the model, and then be fitted together again, forming a complete hollow mold. The inside is then rinsed out with plaster and water mixed to the consistency of cream till a skin of plaster is formed all over the inner surface of the mold, and thus a hollow cast is made of the whole figure. The "piece-mold" is then taken to pieces and the casting set free. If skillfully done by a good *formatore* or molder the plaster cast is a perfect facsimile of the original clay, very slightly disfigured by a series of lines showing the joints in the piece-mold, the sections of which cannot be made to fit together with absolute precision. Many sculptors have their clay models cast in plaster before the modeling is quite finished, as they prefer to put the finishing touches on the plaster cast—good plaster being a very easy and pleasant substance to work on.

The next stage is to copy the plaster model in marble. The model is set on a large block called a "scale stone," while the marble for the future statue is set upon another similar block. The plaster model is then covered with a series of marks, placed on all the most salient parts of the body, and the front of each "scale stone" is covered with another series of points, exactly the same on both stones. An ingenious instrument called a pointing machine, which has arms ending in metal points or "needles" that move in ball-socket joints, is placed between the model and the marble block. Two of its arms are then applied to the model, one touching a point on the scale stone while the other touches a mark on the figure. The arms are fixed by screws in this position, and the machine is then revolved to the marble block, and set with its lower needle touching the corresponding point on the scale stone. The upper needle, which is arranged to slide back on its own axis, cannot reach the corresponding point on the statue because the marble block is in the way; a hole is then drilled into the block at the place and in the direction indicated by the needle, till the latter can slide forward so as to reach a point sunk in the marble block exactly corresponding to the point it touched on the plaster mold. This process is repeated both on the model and on the marble block till the latter is drilled with a number of holes, the bottoms of which correspond in position to the number of marks made on the surface of the model. A comparatively unskilled *scarpellino* or "chisel-man" then sets to work and cuts away the marble till he has reached the bottoms of all the holes, beyond which he must not cut. The statue is thus roughly blocked out, and a more skilled *scarpellino* begins to work. Partly by eye and partly with the constant help of the pointing machine, which is used to give any required measurements, the workman almost completes the marble statue, leaving only the finishing touches to be done by the sculptor.

In modeling bas-reliefs the modern sculptor usually applies the clay to a slab of slate on which the design is sketched; the slate forms the background of the figures, and thus keeps the relief absolutely true to one plane. This method is one of the causes of the dullness and want of spirit so conspicuous in most modern sculptured reliefs. In the best Greek examples there is no absolutely fixed plane surface for the backgrounds. In one place, to gain an effective shadow, the Greek sculptor would cut below the average surface; in another he would leave the ground at a higher plane, exactly as happened to suit each portion of his design. Other differences from the modern mechanical rules can easily be seen by a careful examination of the Parthenon frieze and other Greek reliefs. Though the word "bas-relief" is now often applied to reliefs of all degrees of projection from the ground, it should, of course, only be used for those in which the projection is slight; "basso," "mezzo," and "alto rilievo" express three different degrees of salience. Very low relief is but little used by modern sculptors, mainly because it is much easier to obtain striking effects with the help of more projection. Donatello and other fifteenth-century Italian artists showed the most wonderful skill in their treatment of very low relief. One not altogether legitimate method of gaining effect was practiced by some mediæval sculptors; the relief itself was kept very low, but was "stilted" or projected from the ground, and then undercut all round the outline. A fifteenth-century tabernacle for the host in the Brera at Milan is a very beautiful example of this method, which as a rule is not pleasing in effect, since it looks rather as if the figures were cut out in cardboard and then stuck on.

The practice of most modern sculptors is to do very little to the marble with their own hands; some, in fact, have never really learned how to carve, and thus the finished statue is often very dull and lifeless in comparison with the clay model. Most of the great sculptors of the Middle Ages left little or nothing to be done by an assistant; Michelangelo especially did the whole of the carving with his own hands, and when beginning on a block of marble attacked it with such vigorous strokes of the hammer that large pieces of marble flew about in every direction. But skill as a carver, though very desirable, is not absolutely necessary for a sculptor. If he casts in bronze by the *cire perdue* process he may produce the most perfect plastic works without touching anything harder than the modeling-wax. The sculptor in marble, however, must be able to carve a hard substance if he is to be master of his art. Unhappily some modern sculptors not only leave all manipulation of the marble to their workmen, but they also employ men to do their modeling, the supposed sculptor supplying little or nothing but his name to the work. In some cases sculptors who are neither one nor the other, but who suffer under an excess of popularity, are induced to employ aid of this kind on account of their undertaking more work than any one man could possibly accomplish—a state of things which is necessarily very hostile to the interests of true art. As a rule, however, the sculptor's *scarpellino*, though he may, and often does, attain the highest skill as a carver and can copy almost anything with wonderful fidelity, seldom develops into an original artist. The popular admiration for pieces of clever trickery in sculpture, such as the carving of the open meshes of a fisherman's net, or a chain with each link free and movable, would perhaps be diminished if it were known that such work as this is invariably done, not by the sculptor, but by the *scarpellino.* At the present day there is in England little appreciation of what is valuable in plastic art; there is probably no other civilized country where the state does so little to give practical support to the advancement of monumental and decorative sculpture on a large scale—the most important branch of the art—which it is hardly in the power of private persons to further.

SCURVY, or Scorbutus, a morbid condition of the blood, manifesting itself by marked impairment of the nutritive functions and by the occurrence of hemorrhagic extravasations in the tissues of the body, and depending on the absence of certain essential ingredients in the food.

In former times this disease was extremely common among sailors, and gave rise to a frightful amount of mortality. It is now, however, of rare occurrence at sea, its cause being well understood and its prevention readily secured by simple measures. Scurvy has also frequently broken out among soldiers on campaign, in beleaguered cities, as well as among communities in times of scarcity, and in prisons, workhouses, and other public institutions. In all such instances it has been found to depend closely upon the character and amount of the food. It has been supposed that a too limited diet, in either amount or variety, might induce the disease; but an overwhelming weight of evidence goes to prove that the cause resides in the inadequate supply or the entire want of fresh vegetable matter. The manner in which this produces scurvy is not quite clear. Some high authorities have held that the insufficient supply of potash salts, in which vegetables are rich, is the procuring cause; but it has been found that the mere administration of these salts will neither prevent nor cure scurvy. Hence, while it is probable that this may be one of the factors concerned in the production of the disease, the want of other vegetable constituents, especially vegetable acids, is of still greater importance. Besides this essential defect, a diminution in the total amount of food, the large use of salted meat or fish, and all causes of a depressing kind, such as exposure, anxiety, bad hygiene, etc., will powerfully contribute to the development of the disease.

No disease is more amenable to treatment both as regards prevention and cure, than scurvy, the single remedy of fresh vegetables or some equivalent securing both these ends. Potatoes, cabbages, onions, carrots, turnips, etc., and most fresh fruits, will be found of the greatest service for this purpose. Lime juice and lemon juice are recognized as equally efficacious, and even vinegar in the absence of these will be of some assistance. The regulated administration of lime juice in the navy has had the effect of virtually extinguishing scurvy in the service. It is only when these regulations have not been fully carried out, or when the supply of lime juice has become exhausted, that scurvy among sailors has been noticed in recent times. Besides the administration of lime or lemon juice and the use of fresh meat, milk, etc., which are valuable adjuvants, the local and constitutional conditions require the attention of the physician. The ulcers of the gums and limbs can be best treated by stimulating astringent applications; the hard swellings, which are apt to continue long, may be alleviated by fomentations and frictions; while the anæmia and debility are best overcome by the continued administration of iron tonics, aided by fresh air and other measures calculated to promote the general health.

SCUTAGE or ESCUAGE was one of the forms of knight-service (see KNIGHTHOOD, REAL ESTATE). It was practically a composition for personal service. Scutage appears to have been first imposed on the occasion of the Toulouse War in 1159. Magna Charta (§ 12) forbade the levy of scutage unless *per commune consilium regni.* It appears to have fallen into disuse in the reign of Edward II., and was finally done away with by the Act abolishing feudal tenures (12 Car. II. c. 24).

SCUTARI (Turkish, *Üsküdar*), anciently *Chrysopolis*, a seaport town of Turkey in Asia, on the eastern shore of the Bosphorus, opposite Constantinople, of which it is regarded as a suburb. The inhabitants are largely engaged in the manufacture of saddlery and silk, muslin, and cotton stuffs; the town also contains granaries, and is prized as a fruit-market, more particularly for grapes, lemons, and figs. The population is estimated at 60,000. In the plain of Haidar Pasha close by, between the cemetery and Kadikoi (judge's village, anciently Chalcedon), the English army lay encamped during the Crimean War. In front of Scutari, on a low-lying rock, almost level with the water, and about a cable's length from the shore, rises a white tower ninety feet high, now used as a lighthouse, called "Leander's Tower," and by the Turks Kiz-kulessi, or the "Maiden's Tower." The first printing press in Turkey was set up at Scutari in 1723.

SCUTARI (Turkish, *Scodra;* Slavic, *Skadar*), the capital of North Albania, at the south end of the lake of the same name, with a population of 24,500 in 1880 (mostly Mohammedans). There are some manufactures of arms and of cotton stuffs. In 1884 330 ships, of 123,923 tons, entered the port, and 325 ships, of 123,713 tons, cleared.

SCYLAX of Caryanda in Caria was employed by Darius I. to explore the course of the Indus. He started from Afghanistan and is said by Herodotus (iv. 44) to have reached the sea and then sailed to the Gulf of Suez. Scylax wrote an account of his explorations, which is referred to by Aristotle and other ancient writers, but must have been lost pretty early, and probably also a history of the Carian hero Heraclides, who distinguished himself in the revolt against Darius. But Suidas, who mentions the second work, confounds the old Scylax with a much later author, who wrote a refutation of the history of Polybius, and is presumably identical with Scylax of Halicarnassus, a statesman and astrologer, the friend of Panætius spoken of by Cicero. Neither of these, however, can be the author of the *Periplus* of the Mediterranean, which has come down to us under the name of Scylax of Caryanda in several MSS., of which the archetype is at Paris.

SCYLLA AND CHARYBDIS. In Homer (*Od.*, xii. 73 *seq.*) Scylla is a dreadful sea-monster, daughter of Cratæis, with six heads, twelve feet, and a voice like the yelp of a puppy. She dwelt in a sea-cave looking to the west, far up the face of a huge cliff. Out of her cave she stuck her heads, fishing for marine creatures and snatching the seamen out of passing ships. Within a bowshot of this cliff was another lower cliff with a great fig-tree growing on it. Under this second rock dwelt Charybdis, who thrice a day sucked in and thrice spouted out the sea water. Between these rocks Ulysses sailed, and Scylla snatched six men out of his ship. In later classical times Scylla and Charybdis were localized in the Strait of Messina—Scylla on the Italian, Charybdis on the Sicilian side.

SCYMNUS of Chios, a Greek geographer of uncertain date, known to us only by a few references in later writers, but perhaps identical with the Scymnus Chius of a Delphic inscription of the beginning of the second century B.C., was commonly taken to be the author of an imperfect anonymous *Paraphrasis* in verse describing the northern coast of the Mediterranean, which in the first edition (Augsburg, 1600), was ascribed to Marcianus of Heraclea.

SCYROS, a small rocky barren island in the Ægean Sea, off the coast of Thessaly, containing a town of the same name. A temple of Athena, the chief goddess of Scyros, was on the shore near the town. The island has a small stream, called in ancient times Cephissus. Strabo mentions as its sole products its excellent goats and a species of variegated marble—the latter in great favor at Rome.

SCYTHE AND SICKLE. Till the invention of the reaping machine, which came into practical use only about 1845–50, scythes and sickles were the sole reaping implements. The scythe is worked with two hands with a swinging motion, while the sickle or reaping hook is held in one hand and the reaper bends and cuts the crop with a shearing or hitting motion. Of the two the sickle is the more ancient, and indeed there is some reason to conclude that its use is coeval with the cultivation of grain crops. Among the remains of the later Stone period in Great Britain and on the European continent curved flint knives have occasionally been found, the form of which has led to the suggestion that they were used as sickles. Sickles of bronze occur quite commonly among remains of the early inhabitants of Europe. Some of these are deeply curved hooks, flat on the under-side, and with a strengthening ridge or back on the upper surface, while others are small curved knives, in form like the ordinary hedge-bill. Among the ancient Egyptians toothed or serrated sickles of both bronze and iron were used. Ancient Roman drawings show that both the scythe and the sickle were known to that people, and Pliny makes the distinction plain. Although both implements have lost much of their importance since the general introduction of mowing and reaping machinery, they are still used very extensively, especially in those countries where small agricultural holdings prevail.

SCYTHIA, SCYTHIANS. When the Greeks began to settle the north coast of the Black Sea, about the middle of the seventh century B.C., they found the south Russian steppe in the hands of a nomadic race, whom they called Scythians. An exacter form of the name was Scoloti. The inhabitants of the steppe must always have been nomads; but the life of all nomads is so much alike that we cannot tell whether the Scythians are the race alluded to.

The true Scythians led the usual life of nomads, moving through the steppe from exhausted to fresh pasture-grounds, their women in wagons roofed with felt and drawn by oxen, the men on horseback, the droves of sheep, cattle, and horses following. They lived on boiled flesh, mare's milk, and cheese; they never washed, but enjoyed a narcotic intoxication in combination with a vapor bath by shutting themselves up within curtains of felt and strewing hemp seed on heated stones. The women, in place of washing, daubed themselves with a paste containing dust of fragrant woods and removed it on the second day. Like many other barbarians, the Scythians, at least in Hippocrate's time (ed. Littré, ii. 72), were not a specially hardy race; they had stout, fleshy, flabby bodies, the joints concealed by fat, their countenances some what ruddy. The observation of Hippocrates that they all looked alike is one that has often been made by travelers among lower races. They were liable to dysentery and rheumatism, which they treated by the actual cautery; impotence and sterility were common, and, though the accounts vary, it is probable that the race was not very numerous (Herod., iv. 81).

Hippocrate's description has led many writers to view the Scythians as Mongolian; but the life of the steppe impresses a certain common stamp on all its nomad inhabitants, and the features described are not sufficiently characteristic to justify the assumption of so distant a Mongol migration. What remains of the Scythian language, on the other hand, furnishes Zeuss with clear proofs that they were Aryans and nearly akin to the settled Iranians. The most decisive evidence is found in Herodotus, viz., that Scythians and SARMATIANS (*q.v.*) were of cognate speech; for the latter were certainly Aryans, as even the ancients observed, supposing them to be a Median colony. The whole steppe lands from the Oxus and the Jaxartes to the Hungarian psuztas seem to have been held at an early date by a chain of Aryan nomad races.

The government was strictly despotic, as appears most plainly in the hideous customs at the burial of kings. The corpse of an ordinary Scythian was carried about among all the neighbors for forty days, and a funeral feast was given by every friend so visited. But the royal corpse was embalmed and passed in like manner from tribe to tribe, and the people of each tribe joined the procession with their whole bodies disfigured by bloody wounds, till at length the royal tombs at Gerrhi were reached. Then the king was buried along with one of his concubines, his cupbearer, cook, groom, chamberlain, and messenger, all of whom were slain. Horses, too, and golden utensils were buried under the vast barrow that was raised over the grave. Many such tumuli (called in Tartar *kurgan*) have been found between the Dnieper and the sources of the Tokmak, a tributary of the Molotchnaya. Then, on the first anniversary, yet fifty horses and fifty free-born Scythian servants of the king were slain, and the latter were pinned upright on the stuffed horses as watchmen over the dead.

Our accounts of the Scythians begin to fail after the time of King Scyles, who affected Grecian habits and was deposed and finally slain for sharing in Bacchic orgies (Herod., iv. 78–80); his death fell a little before Herodotus' visit to Olbia (*c.* 456). We read in an unclear context (Diod., ii. 43) of the division of the Scythians into two great tribes, the Pali and the Napæ, the former of whom crossed the Don from the east and destroyed the latter and also the Tanaites. These events seem to point to a change of dynasty in the royal horde.

The Scythians appear once more in the region of the Dobrudja in 313; when they helped the citizens of Callatis against Lysimachus and were defeated by him (Diod., xix. 73). All this points to a considerable advance of their frontier southward, and in fact Pseudo-Scymnus (Ephorus) gives Dionysopolis (a little to the west of the modern Baltchik) as the place where the Crobyzian and the Scythian territories met in his time, (334 B.C.) This apparent advance of the realm contrasts singularly with the distress to which Ateas was reduced by the king of the insignificant town of Istrus, an evidence that the Scythian power was really much decayed. Ateas indeed is sometimes painted as a rude barbarian lord of a poor but valiant and hardy race, and Ephorus, who mainly follows Herodotus about Scythia, yet speaks of the Scythians in contrast with the fierce Sarmatians as corresponding to Homer's description of a just and poor people feeding on milk (Strabo, vii. 302). But Aristotle, on the contrary (*Eth. Nic.*, vii. 8), speaks of the effeminacy of the Scythian monarchs as notorious; and indeed there can be little doubt that the Scythians crossed the Danube and settled in the Dobrudja under pressure of the Sarmatians behind them, and that the idyllic picture drawn by Ephorus presupposes the fall of their political system. Diodorus (ii. 43) tells us that the Sarmatians exterminated the inhabitants of most part of Scythia, and this must have taken place in the later years of Ateas, between 346 and 339.

SEA. Any part of the ocean marked off from the general mass of water may be called a sea. In geography the name is loosely applied: for instance, the Arabian Sea is an open bay, Hudson's Bay is an inclosed sea. Seas proper lie within the transitional area which divides the permanent continental masses from the permanent ocean basins, and their boundaries are consequently subject to geological change, and to alteration by subsidence and elevation occurring in historic times.

Inland Seas are seas entirely surrounded by land (see CASPIAN SEA, DEAD SEA, and, for general discussion, LAKE).

Inclosed Seas have communication with the ocean restricted to one opening, which may take the form of one, two, or more straits close to each other. The best known are the White Sea of the Arctic Ocean; the Baltic, Zuyder Zee, Hudson's Bay, Gulf of Mexico, and Mediterranean, with the Adriatic and Black Sea, of the Atlantic; the Red Sea and Persian Gulf of the Indian Ocean; and the Yellow Sea and Sea of Okhotsk of the Pacific.

Partially Inclosed Seas may be (*a*) comparatively shallow irregular channels through which strong tides sweep, or (*b*) ocean basins cut off by barriers barely rising to the surface, or remaining permanently submerged, in which case there may be no break of continuity in the ocean surface to indicate the sea.

Other Seas.—Coral Sea, Arabian Sea, Sea of Bengal, are names, now dropping out of use, to designate parts of the ocean. "Sargasso Sea" is an expression devoid of geographical meaning (see ATLANTIC OCEAN).

SEA-CAT. See SEA-WOLF.

SEA-DEVIL. See FISHING-FROG.

SEA-HORSE. Sea-horses (*Hippocampina*) are small marine fishes which, together with pipe-fishes

(*Syngnathina*), form the order of Lophobranchiate fishes. The gills of the members of this order are not arranged in leaf-like series as in other fishes, but form a convex mass composed of small rounded lobes attached to the branchial arches. Sea-horses differ from pipe-fishes by having a prehensile and invariably finless tail; it is long, slender, tapering, quadrangular in a transverse section, and, like the rest of the body, encased in a dermal skeleton, which consists of horny segments, allowing of ventral, and in a less degree of lateral, but not of dorsal, flexion. The typical sea-horse (*Hippocampus*) can coil up a great portion of its tail, and firmly attach itself by it to the stems of sea-weeds or other similar objects. The body is compressed and more or less elevated, and the head terminates in a long tubiform snout, at the end of which the small mouth is situated. The whole configuration of the fore part of the body, as well as the peculiar manner in which the head is joined to the neck-like part of the trunk, bears a striking resemblance to a horse's head; hence the name by which these fishes are generally known. Sea-horses are bad swimmers and are unable to resist currents. With the the aid of their single dorsal fin, which is placed about the middle of the fish's body and can be put into a rapid undulatory motion, they shift from time to time to some other object near them, remaining stationary among vegetation or coral where they find the requisite amount of food and sufficient cover. Their coloration and the tubercles or spines on the head and body, sometimes with the addition of skinny flaps and filaments, closely resemble their surroundings, and constitute the means by which these defenseless creatures escape detection by their enemies. These protective structures are most developed in the Australian genus *Phyllopteryx*, one of the mot singular types of littoral fishes.

Sea-horses belong to the tropics and do not extend so far north as pipe-fishes. They are abundant at suitable localities, chiefly on the coral-banks of the Indo-Pacific Ocean.

SEAL. Although seals swim and dive with the greatest ease, often remaining as much as a quarter of an hour or more below the surface, and are dependent for their sustenance entirely on living prey captured in the water, all the species frequently resort to sandy beaches, rocks, or ice-floes, either to sleep or to bask in the sun, and especially for the purpose of bringing forth their young. The latter appears to be the universal habit, and, strange as it may seem, the young seals—of some species at least—take to the water at first very reluctantly, and have actually to be taught to swim by their parents. The number of young produced is usually one annually, though occasionally two. They are at first covered with a coat of very thick, soft, nearly white fur, and until it falls off they do not usually enter the water.

Most kinds of seals are gregarious, and congregate, especially at the breeding season, in immense herds. Such is the habit of the Greenland seal (*Phoca grœnlandica*), which resorts in the spring to the ice-floes of the North Sea, around Jan Mayen Island, where about 200,000 are killed annually by the crews of the Scotch, Dutch, and Norwegian sealing vessels. Others, like the common seal of the British islands (*Phoca vitulina*), though having a wide geographical range, are never met with in such large numbers or far away from land.

Although the true seals do not possess the beautiful under-fur ("seal-skin" of the furriers) which makes the skin of the sea-bears or *Otariæ* so precious, their hides are still sufficiently valuable as articles of commerce, together with the oil yielded by their fat, to subject them to a devastating persecution, by which their numbers are being continually diminished.

Seal Fisheries.—From a commercial point of view seals may be divided into two groups—hair seals and fur seals. The former are valued for the oil they yield and for their skins, which are converted into leather, and the latter for their skins alone. The fur seals are provided with a dense soft under-fur like velvet and a quantity of long loose exterior hair, which has to be removed in dressing the hides. Hair seals are either entirely without under-fur or possess it in too small a quantity to render the skins of much commercial value as furs. The two groups correspond to the two divisions of eared seals and earless seals.

Hair Seals.—The principal hair seal fisheries are those of Newfoundland and Labrador (area about 200 miles), the Gulf of St. Lawrence, Jan Mayen and the adjacent seas, Nova Zembla, the White Sea and Arctic Ocean, the Caspian, and the North and South Pacific. The first-named is by far the most important.

From 8,000 to 10,000 men embark annually from Newfoundland on this pursuit. The steamers, which are rapidly superseding sailing vessels, are stoutly timbered, sheathed with iron and wood, and provided with iron-plated stems; they carry from 150 to 300 men each, and make two, and sometimes when very successful even three, trips in the season. From twenty to twenty-five steamships in all are engaged in this industry, six of these being from Dundee, Scotland. The Dundee vessels arrive in Newfoundland in February and there ship their crews; at the close of the sealing season they proceed to the northern whale fishery and return home in October. A "close time" for seals is now established by law. Sailing vessels cannot clear for this fishery before March 1st, nor can steamers before March 10th. After the young seals have taken to the water, the steamers in their second trips engage in the pursuit of the old breeding seals till the middle or end of May. These are taken either by shooting them or clubbing them when congregated in herds on the ice. This practice, which is most injurious to the fishery, has of late been partially abandoned, by an agreement among the owners of vessels not to continue operations beyond April 30th. The failures and disappointments of the voyage are numerous, many vessels returning to port with few seals or even with none. The prizes, however, are so enormous that there is no hesitation in embarking capital in the enterprise. It is no uncommon event for a steamer to return two or three weeks after leaving port laden to the gunwale with seals. As many as 42,000 have been brought in by a single steamer, the value at $2.50 per seal being $105,000.

Fur Seals.—The fur seals occupy two distinct areas. None exists on the shores of the North Atlantic. South of the equator they extend from near the tropics to the region of antarctic ice. By far the most important and valuable fur seal fisheries are those carried on at St. Paul's and St. George's Islands, belonging to the Pribyloff group, off the coast of Alaska, at the Commander Islands in the Behring Sea, and that in the same sea 700 miles west of the Alaskan seal islets. The species found here is the northern fur seal (*Callorhinus ursinus*). The males attain mature size about the eighth year, when their length is from seven to eight feet, their girth from seven to eight feet, and their weight, when in full flesh from 500 to 700 pounds. The females are full grown at four years old, when they measure four feet in length, two and one-half in girth, and weigh from 80 to 100 pounds. The yearlings weigh from thirty to forty pounds. The seals resort to these islands late in spring chiefly for reproductive purposes, making their appearance from the southward. The number annually visiting St. Paul's and St.

George's is estimated at five millions. About the middle of April the males begin to arrive and take their places along the shore in "the rookeries," as the breeding-grounds are called. The younger males are prevented from landing by the older, and are compelled either to stay in the water or to go to the uplands. By the middle of June all the males have assembled, and then the females begin to appear. Each old male seal collects from ten to fifteen or more females, whom he guards most jealously. The males fight furiously, "so that night and day the aggregated sound is like that of an approaching railway train." By the middle of July the family circle is complete. Soon after landing the female gives birth to one pup, weighing about six pounds, which she nurses at wide intervals without any affection. Pairing takes place soon afterward. No food is taken by the breeding males while on the rocks—a period of three to four months. When the males leave after this long fast, they are reduced to half their former weight. In the end of October and middle of November all leave the island, the young males going last.

SEA LAWS, a title which came into use among writers on maritime law in the sixteenth century, and was applied by them to certain mediæval collections of usages of the sea which had been recognized as having the force of customary law, either by the judgments of a maritime court or by the resolutions of a congress of merchants and shipmasters. To the former class belong the sea laws of Oléron, which embody the usages of the mariners of the Atlantic; under the latter come the sea laws of Wisby, which reflect the customs of the mariners of the North Sea and of the Baltic.

The earliest collection of such usages which was received in England is described in the *Black Book of the Admiralty* as the "Laws of Oléron," while the earliest known text is contained in the *Liber Memorandorum* of the corporation of the City of London, preserved in the archives of their Guildhall. These laws are in an early handwriting of the fourteenth century, and the title prefixed to them is *La Charte d'Oleroun des Juggementz de la Mier*. How and in what manner these "Judgments of the Sea" came to be collected is not altogether certain.

The earliest version of these Oléron sea laws, which, according to the memorandum above mentioned, were received in England in the latter part of the twelfth century, comprised certain customs of the sea which were observed in the wine and oil trade, as carried on between the ports of Guienne and those of Brittany, Normandy, England, and Flanders. No English translation seems to have been made before the *Rutter of the Sea*, printed in London by Thomas Petyt in 1536, in which they are styled "the Lawes of ye Yle of Auleron and ye Judgementes of ye See."

A new and enlarged collection of sea laws, purporting to be an extract of the ancient laws of Oléron, made its appearance in the latter part of the fifteenth century in *Le Grant Routier de la Mer*, printed at Poitiers in France by Jan de Marnef, at the sign of the Pelican. The title page is without a date, but the dedication, which purports to be addressed by its author Pierre Garcie *alias* Ferrande to his godson, is dated from St. Gilles on the last day of May, 1483. It contains forty-seven articles, of which the first twenty-two are identical with articles of the "Judgments of the Sea," in the *Liber Memorandorum*, the remaining articles being evidently of more recent origin.

The parent stock of the Wisby sea laws would appear to have been a code preserved in the chancery of Lübeck, drawn up in the Old Saxon tongue, and dated 1240. This code contains among many others certain articles on maritime law which are identical with articles in the Gothland sea laws, Gothland being the island of which Wisby was the chief port. This collection comprises sixty-six articles, and it is now placed beyond a doubt by recent researches, especially of Professor Schlyter of Lund, that these Gothland sea laws are a compilation derived from three distinct sources—a Lübeck, an Oléron, and an Amsterdam source. A Saxon or Low German text of this collection was printed for the first time in 1505 at Copenhagen by Godfrey de Gemen, a native of Gouda in Holland, who is reputed to have set up the earliest printing-press in Copenhagen.

The text of the Wisby sea laws generally current in England is an English translation of a French text which Cleirac published in 1641 in his *Us et Coustumes de la Mer*, and is an abbreviated, and in many respects mutilated, version of the original sea laws. This inquiry, however, would open a new chapter on the subject of the northern sea laws, and the civilizing influence which the merchants of Wisby exercised in the thirteenth century through their factories at Novgorod, linking thereby the trade of the Baltic to that of the Black Sea.

SEALING WAX. In mediæval times, when the principal use of sealing wax was for attaching the impression of seals to official documents, the composition used consisted of a mixture of Venice turpentine, beeswax, and coloring matter, usually vermilion. The preparation now employed contains no wax. Fine red stationery sealing wax is composed of about seven parts by weight of shellac, four of Venice turpentine, and three to four of vermilion. The resins are melted together in an earthenware pot over a moderate fire, and the coloring matter is added slowly with careful stirring.

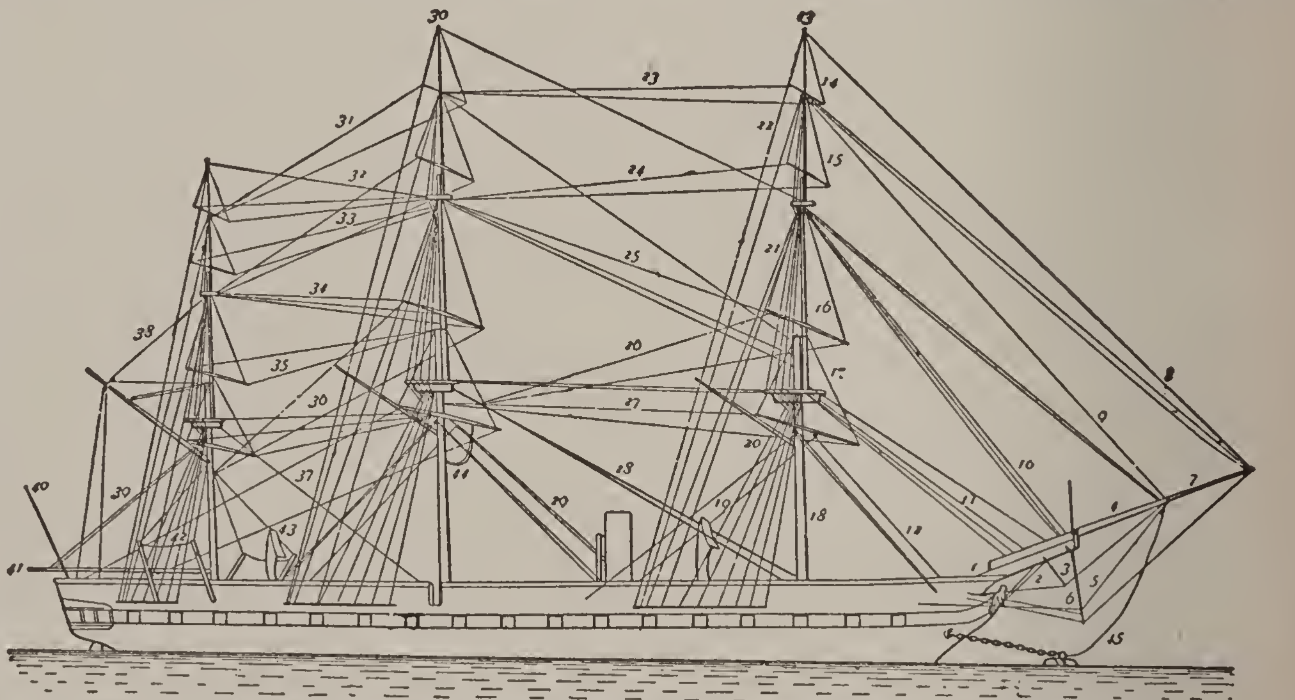
SEALKOTE. See SIALKOT.

SEALS (Gr. σφραγίς, Lat. *sigillum*). During the mediæval period the importance of seals was very great, as they were considered main proofs of the authenticity of all sorts of documents, both public and private. That is much less the case now, the written signature being thought a safer guarantee of genuineness. In order to make illicit use or imitation of a seal difficult, the seal itself was usually locked up and guarded with special care, and in the case of royal personages or corporate bodies was often made a very complicated work of art, which it would have been almost impossible to copy exactly. One very curious precaution that was adopted is still in use with the corporate seal of the monasteries of Mount Athos. The circular matrix is divided into four quarters, each of which is kept by one of the four *epistatai* or ruling monks; the four pieces are joined by a key-handle, which remains in the custody of the secretary. Thus it is only when all five guardians of the various parts of the matrix meet together that the complete seal can be stamped on any document. The device on the Mount Athos seal is a half-length figure of the Madonna and Child, and the imprint is made by blacking the matrix in the flame of a lamp and then pressing it on the paper or vellum itself. Mediæval seals were applied in two different ways: in one the stamp was impressed in wax run on the surface of the document (Fr. *plaqué* or *en placard*); in the other the wax impression was suspended by cord or strips of parchment (Fr. *pendant*). The latter method was necessarily used with metal seals or *bullæ*.

For the sake of greater security in the case of *plaqué* seals, it was a common practice from the twelfth century onward, or even earlier, to make a cross cut in the vellum of the document, the corners of which were then turned back, thus forming a square opening, over which the wax seal was stamped; the turned-up corners helped to hold the wax in its place, and the aperture allowed a second matrix to be applied at the back. This was usually a smaller private seal called a *secretum*. Thus, for example, an abbot would use on the front of a document the large corporate seal of his community, and on the back would stamp his personal seal as a *secretum*.

Till the twelfth century pure white beeswax was generally used, after that wax colored green or red. The use of shellac or other harder materials, such as modern sealing wax, is of recent date. Thus it was usual to protect the soft wax seals by some sort of "fender," often a wreath of rushes or plaited strips of paper twisted round it; another method much employed in the fifteenth century was to cover the seal with leaves of oak, bay, or beech. *Pendant* seals were often encased in boxes of wood or *cuir bouilli*, which in some cases are very richly decorated. From the thirteenth to the fifteenth century original royal documents are usually on fine vellum and have green seals hung by many-colored silk and gold threads, while office copies are on coarser vellum and have white seals hung by parchment strips. In England an important official, called the clerk of the chafe-wax, an office which still exists, was entrusted with the duty of softening the wax for state seals over a chafing-brazier. Two different methods of sealing documents, either closed or open for inspection, are recorded in the legal terms "letters secret" and "letters patent."

SEAMANSHIP is the art of sailing, maneuvering, and preserving a ship or a boat in all positions and under all reasonable circumstances, and thus involves a sound practical knowledge of all the forces by which she may be actuated and the means at command to assist or counteract them; it is a branch of applied mechanics acquired by experience and study. The former can only be obtained thoroughly in many years spent at sea, in personal connection with the work of the ship and her boats; that such training should commence at an early age is very desirable, if not even imperative. The practical knowledge so gained should be supplemented and improved by reading, conversation, and discussion, as the casualties which befall ships are so varied that a man may pass forty years in sea-going vessels without experiencing one-half of those which might occur. Many of the old maxims are still applicable to every class of vessel and must always remain so.



—The spars and rigging of a frigate.[1] 1, the bowsprit, 2, bobstays, three pairs; 3, sprit-sail-gaffs, projecting on each side of the bowsprit,—the ropes at the extremities are jib-guys and flying-jib-guys; 4, jibboom; 5, martingale-stay, and below it the flying-jib-martingale; 6, back-ropes; 7, flying-jibboom; 8, fore-royal-stay, flying-jib-stay, and halyards; 9, fore-top-gallant-stay, jib-stay, and halyards; 10, two fore-top-mast-stays and fore-top-mast stay-sail halyards; 11, the fore-top-bowlines, stopped into the top and two fore-stays, 12, two fore-tacks; 13, fore-truck; 14, fore-royal mast, yard, and lift; 15, top-gallant-mast, yard, and lift; 16, fore-top-mast, top-sail-yard, lift, and reef-tackle; 17, fore-top, fore-lift, and top-sail-sheet; 18, fore-mast and fore-shrouds, nine pairs; 19, fore-sheets; 20, fore-gaff; 21, fore-top-mast back-stays and top-sail-tye; 22, royal and top-gallant back stays; 23, fore-royal-braces and main-royal-stay; 24, fore-top-gallant-braces and main-top-gallant-stay; 25, standing parts or fore-top-sail-bracea and main-top-mast-stays; 26, hauling parts of fore-top-sail-braces and main-top-bowlines; 27, four parts of fore-braces; 28, main-stays; 29, main-tacks; 30, main-truck; 31, main-royal braces; 32, mizzen-royal-stay and mizzen-royal-braces, 33, main-top-gallant-braces and mizzen-top-gallant-braces; 34, standing parts of main-top-sail-braces and mizzen-top-mast-stay; 35, mizzen-top-sail-braces; 36, hauling parts of main-top-sail-braces, mizzen-top-bowlines, and cross-jack-braces; 37, main-bracea and mizzen-stay; 38, standing part of peak halyards; 39, vangs, similar on each gaff; 40, ensign staff; 41, spanker-boom; 42, quarter-boat's davits; 43, one of the davit topping-lifts and wind-sail; 44, main-yard-tackle; 45, a bull-rope.

The terms "ship" and "vessel" are here intended to embrace all classes, though "ship" is generally applied to the larger without reference to form or description unless such is specified. Though the use of sails has been greatly superseded by the introduction of steam-power both in the navies of all nations and in the mercantile marine, it is still generally admitted that seamanship is best acquired on board a vessel which is dependent upon her sails. The construction and equipment of sailing ships had reached a high point of perfection at the time steam came into general use. The power derived from the steam-engine does not change any of the former conditions, but simply adds another element, confined to propulsion directly ahead or astern (except with reversible wheels or twin screws), which when combined with sails renders a ship much more manageable and safe—that is to say, assuming all the forces at command to be properly applied. Hence it is very desirable that all ocean-going steam vessels should have sufficient sail-power to turn them round (wear) or to enable them to sail with the wind abeam without steam, especially when fitted with single screws or with paddle wheels which do not work separately. Twin screws, of course, give a double chance as far as the engine is concerned; but even with that advantage the loss of the rudder would leave the ship in a helpless condition if she had not efficient head and after sails to balance her on the desired course.

At present the excessive desire to make quick passage has greatly augmented the danger unavoidably attending a sea voyage, the risk as well as the violence of a collision at high speed in thick weather being thereby much increased. Through the want of masts and sails there is a probability of total loss by drifting helplessly on a lee shore during a gale, or by foundering "in the trough of the sea." In spite of her monstrous size (22,000 tons), the "*Great Eastern*," in 1863 or 1864, with her six comparatively small masts and weak sails was, after the loss of her rudder, very roughly used by the waves striking her full on the side. She was in the position which is expressed by the common sea-phrase "wallowing in the trough of the sea," from which her crew had no power to extricate her. A smaller vessel deeply laden in such a position would most probably have foundered, leaving no one to tell the tale. Too much stress is laid upon the retardation caused by masts and rigging when steaming head to wind; it is the pitching and plunging motion of the ship into a succession of waves that principally retards her speed. If the waves are approaching at the rate of ten miles an hour and the ship is steaming against them at a similar rate, they will strike the bows with a force equal to twenty miles an hour. When a ship is steaming through comparatively smooth water (sheltered by land) against a gale of wind, her speed is but little reduced by the force of the wind alone, when other circumstances admit of her working full power. Storm-sails only require short masts, but these and the canvas they support should be strong, which is not the case in the merchant service generally.

Every seaman is expected to be thoroughly acquainted with the rigging of the vessel in which he serves, and when in charge he should frequently examine every part, to see that it is efficiently performing the duty assigned to it, being neither too taut nor too slack, nor suffering from chafing, wet, or other injury. He should be capable of repairing or replacing any part with his own hand if necessary and of teaching others how to do so. He need not necessarily be a navigator, though a good navigator must be a seaman; nor is it necessary that a seaman should be a shipbuilder, a mast-maker, a rope-maker, or a sail-maker, but he should possess a general knowledge of each art, especially the last; every able seaman should be able to sew a seam and assist the ship's sail-maker in repairing sails. It is greatly to be regretted that various circumstances have brought about such a change in the system of rigging ships, in both the British navy and the mercantile marine, that those who sail in them seldom see it done. Young officers were in former times frequently intrusted with the charge of day watches, during which they would give the necessary orders for making, shortening, or trimming sails, perhaps even tacking and wearing. That practice gave confidence and quickened the desire to learn more; it was more frequently done in small than in large ships. The general adoption of the steam-engine in ships has not only diminished the value of sail-power but of seamanship also, and has produced such a change in the rig that instead of masts and yards we find only two or three poles. In the British navy so many new sciences have been introduced that seamanship takes but a low place among them at the examination of a midshipman, who has had but little boat duty and probably found the discussion of seamanship in his mess-place contrary to the rule. The rapidity with which all sail and mast drill is executed, combined with the perfection of the "station bill," renders it worse than useless as a means of teaching, as it gives a false confidence which fails in the hour of necessity, when the accustomed routine is thrown out by a sail actually splitting to pieces or a spar snapping. The fact that the same men perpetually do the same thing must tend greatly to render each evolution quick so long as every one is in his accustomed place, but sickness or the absence of a party from duty will disorganize the ship for some time, as the general usefulness of the men has been cramped. Sail drill in harbor is open to grave objections: unless in a tide-way, the ship must be invariably head to wind; for reefing and furling the yards are laid square, consequently flat aback; both earings are hauled out at once, and as it is only for exercise they are only half secured. Even when reefing topsails at sea, either for exercise or of necessity, in company with other ships, the yards are laid square to enable the men to get readily on the weather-side; therefore, if on wind, the sail must remain aback or the ship must be kept away till the wind is on the beam in order to shake the sail.

The disposition of all heavy weights is worthy of serious attention; for not only ought the vessel to be brought to the draught and trim designed by the builder, or that which has by experience been found the best, but there must not be too much strain at any one part, especially the extremities. In ships intended for sailing or steaming rapidly this is of vital importance; the bows and sterns of cutter or schooner yachts should be empty. Placing the weights in the wings of the hold will steady the rolling motion and make the intervals longer; but this may be carried too far for stability—especially if the vessel has a low free-board. Weights low down close to the keel will increase stability at the expense of a quick uneasy jerking motion. A yacht which carries much ballast low down will be very stiff under canvas and may sail well in the Solent, but would be unfit to go outside the Isle of Wight. When heavy weights are carried in merchant ships as part cargo, they should never be placed as a solid mass; railway bars, for instance, may be stowed gridiron fashion a foot apart, by which means they will occupy as much space and act upon the ship in the same way as an equal weight of provision casks.

Before bending sails all the ropes are rove ready for use. A yacht's sails if new should be scrubbed, to take the stiffness out of them. In all cases they should be set when bent and the yards braced each way (unless it is blowing too hard), or there is a risk of something going wrong when they are required for use. In setting them care should be taken that no part is stretched or girt unduly.

The inner end of a chain cable is usually secured by a tongue-slip and by a short piece of cable which passes round the mast or is shackled to the keelson; it still retains the name of "clinch." The tongue should not have scope enough to reach the compressor, as it has been known to strip back the ring and slip the cable. It is a good thing to trice up the slip before the cable is stowed, so that it will be accessible at all times, either for slipping, shackling another cable, or bending a hawser. It may be thought that a chain cable would run into the locker and stow itself, but that is a mistake; if care is not taken to spread it evenly, it will form a pyramid with turns round the base, upon which the upper part will fall as soon the ship leans over; it will then be necessary to haul up several small bights before the cable will run clear.

A ship should never lie long at single anchor in a tide-way or during variable winds, for fear of fouling her anchor and thereby destroying its holding power. Frequently space is wanted, as ship and cable range over a large circle, with liability to foul other ships or their anchors. A long scope of cable will only keep a ship clear of her anchor during very light winds, unless assisted by close attention and correct judgment on the part of the seaman. The direction of the two streams of tide should be considered in connection with the wind in order to keep the ship to leeward of her anchor each time she passes it. A strong wind blowing across the direction of the tide and acting on the hull of the ship will secure that effect; but, when the directions of wind and tide are the same or nearly so, precaution is necessary at each turn of the tide; it is then that a buoy watching over the anchor is of great service. When the wind and tide are in the same direction, the helm should be kept over to that side which will cause the ship's head to point in the direction on which she has previously passed the anchor, as the bight of the cable will be dragging that way. The force of the tide alone will cause her to shoot over considerably; but when she is assisted by the fore-top-mast stay-sail (or stay-fore-sail in a small vessel) the sheer will be much greater. The sheet in either case is better to windward and the fore-top-sail braced sharp abox if the wind is light; but when the tide commences to change, the sail should be allowed to fill, or it should be taken in and the helm placed in midships. If sufficient effect has not been produced by helm and head-sails before the tide ends, the mizzen-top-sail should be set as soon as the ship falls head to wind, first braced abox to turn her stern in the desired direction, and then flat aback so as to drag the cable straight. Cutters and schooners have not that advantage; they must depend on the helm and head-sails. At the end of a weather tide the helm and stay-sail will guide the vessel past the anchor. If a ship should break her sheer (pass the wrong way), or during calms and variable winds should approach her anchor, the cable should be hove in, and if there is reason to suspect the clearness of the anchor, it should be sighted, since it will be of no use as an anchor if a turn of cable is round the fluke. When anchoring, the state of the tide must be considered in connection with the depth of water; a vessel was once left high-and-dry by the ebb-tide near Dungeness, and a large iron ship drove her own anchor through her bottom in the Solent, off Lymington. The avoidance of the anchors in shallow water is another reason for mooring.

When a ship is in an exposed position, where it may become necessary to let go two or three anchors through stress of weather, in any part of the northern hemisphere, the bower on the port side should be used first, next the foremost one on the starboard side, and as a third, the after one on the starboard side, since the ordinary wind veers with the sun, and at the end of the gale the cables will be clear of each other. In the southern hemisphere the reverse order holds good.

When a ship is likely to remain many days at an anchorage where there is a tide or variable winds it is better to moor at once on arrival, with a scope of cable each way six or eight times greater than the depth of water, and an open hawse toward the worst wind. The two cables combined should always be much in excess of the distance between the anchors, otherwise they will possess but little strength to resist a rectangular strain —an error frequently committed. The amount of support which cables will render under such circumstances will be in proportion to the sine of the angle contained between the anchor and the ship's bow and a line from one anchor to the other. Suppose, for example, a ship moored with anchors east and west of each other, 100 fathoms apart and having fifty-five fathoms on each cable, in ten fathoms of water. With chain cables the hawse pipes would not be more than fifty-three fathoms from each anchor, consequently with a south wind the support given to the ship by each cable will only be 33 per cent. of the strain on the cable—that is, say, sixty-six tons combined when the cables are strained up to one hundred tons each. The support increases rapidly as the cable is veered; an addition of five fathoms each way will (under the above circumstances) give 101 tons, and a scope of eighty fathoms each way will give 153 tons. In practice the cables by dragging over the ground, especially soft mud, assume a direction more ahead, particularly when each cable has a long scope. The anchors should be placed sufficiently far apart to prevent fouling with the slack chain, but not farther, unless the water is too shallow to allow the ship to pass over her anchor at low tide. Such an anchorage is not suitable for very long ships unless special moorings are provided.

It is desirable that every vessel should carry anchors as large as she can stow and work conveniently, and cables to correspond. A wooden-stocked anchor is lighter when under water than an iron-stocked one of similar holding power, and the wooden stock is less liable to foul when let go; but the durability of iron has nearly rendered the wooden stock obsolete. The old-fashioned anchor with long shank, fluke, and stock had greater holding power and certainty of grip than the more compact dumpy anchor now in common use. Backing large anchors by smaller ones is now seldom practiced, except when vessels are on shore and the anchor is laid out on a sandy bottom; it is generally better that each anchor should have its own cable and proportionate strain. Floating anchors were formerly used to keep ships' bows up in a gale; they were made of iron crossbars and three or four thicknesses of strong canvas, or a spar with a heavily weighted sail, spanned with a stout hawser; such a contrivance might frequently be improvised and used to prevent a boat or small vessel from foundering.

In getting a ship under way there are a few precautions which should necessarily be observed. If the ship is moored, the first anchor to be weighed is that which it would be least convenient to sail from. At the time of unmooring the direction of the tide is very important in the case of sailing ships, and should not be disregarded by steamers. The hauling part of the cat-fall is always through the foremost sheave, to prevent the tackle from fouling owing to the ship's motion through the water. The cable on the second anchor should always be hove short before making sail. Should there be plenty of room and the wind moderate, there is no caution necessary beyond placing leadsmen in the chains with newly marked lines, and putting the helm hard over each way to insure its being clear. The after-yards should be braced up on one tack and the head-yards on the other, to pay her head off; in cutters and schooners the stay-fore-sail is used for that purpose. If another vessel is at anchor too close astern to insure gathering way while ahead of her, it should not be attempted; but, by squaring the after-yards as soon as the anchor is tripped, the ship's head will pay off till it becomes safe to fill all the sails and pass under the stern of the other vessel. The anchor should have been *catted*, perhaps *fished* also, during the interval; much way should never be on the ship till the anchor is secured, for fear of it slipping or of a man falling overboard. Should rocks or shallow water be inconveniently close astern different means must be adopted. If the wind blows directly on shore, offering no choice of direction, and a current runs parallel to the shore, the ship's head should be cast against the stream. The yards should be braced abox sharp up, with as much sail set over them as the force of the wind will allow, every means being taken to heave the anchor up quickly; and, in a well-manned ship, as soon as it is out of the ground, haul on board the main-tack and aft with the sheet, set jib and spanker. The helm being alee, keep it so as long as is required, and brace round the head-yards quickly; the ship will soon spring ahead. Then by keeping close to the wind, the rate of movement will be retarded till the anchor is secured; then set the fore-sail.

To tack a fore-and-aft-rigged vessel is very simple; by easing off the jib and fore-sheets at the time the helm is eased down and hauling over the main-sheet, the vessel will soon run up to the wind; then if the fore-sheet is hauled flat over as for the former tack it will assist to pay her bow off the right way. The jib-sheet would be hauled aft while shaking, but not too soon to cause it to take the wrong way. The fore-sheet is shifted over as the other sails are about to fill, according to the speed with which the vessel is paying off. In a smart vessel, such as a cutter-yacht in smooth water and with a good breeze, there will be no occasion to retain the fore-sheet, but allow it to shake itself over similarly to the jib. Returning to the idea of tacking with difficulty—the helm should be put hard over as the speed decreases and reversed directly stern-way commences; this remark applies to vessels of all shapes and sizes, as will also the advice not to put the helm over to a large angle while the vessel is going at great speed. At an angle of 10 degrees, more than 98 per cent. of the force on the rudder is applied to turning the vessel and 17½ per cent. to retard her; while at 30 degrees one-half the force would retard and 86½ per cent. tend to turn. Hence we see the reasons for recommending close fitting, broad, tapering rudders.

While the vessel is in stays the weather-boom topping-lift should be pulled to take the weight of the boom, the runner-and-tackle on the weather side set up, and the lee one slacked as soon as she is round; also shift the main tack-tackle over to windward and set it up; get a pull of the gaff-topsail tack if necessary.

The jib of a cutter, yawl, or schooner with a running bowsprit is a difficult sail to handle when the vessel is under way. If there is sea-room it is better to keep the yacht away before the wind and let go the outhaul, when the traveler will run in, or pull at the same time on the inhaul, which should be fitted with a span to keep it square. Haul the stay-foresail sheet over to make room to haul in the jib to leeward of it. Gather in the slack canvas smartly to keep it from getting overboard; get hold of the luff of the sail by the stay-rope, while some hands pull on the downhaul. When the sail is perfectly under control let go the halyards and continue hauling on the stay-rope and downhaul. When there is not room to run before the wind, it is best to heave to with foresheet to windward while taking in or shifting a jib; by letting go the outhaul the traveler will run in and the sail can be handled as before, a good hold being always kept of the weather side, that is, the luff of the sail. If another jib is to be bent it should be laid along the weather side of the deck in readiness, with the tack forward and the head aft. The sheets are then untoggled from the former sail, handed across outside (to windward) of the fore-stay, and toggled to the second jib; also take the tack to the traveler; hook it, and run it out. Hook the halyards and hoist the jib up by them; then tauten the luff by the purchase while the sheet is flowing.

As bad weather comes on the main-sail must be reefed (a smaller jib having been already set) by topping up the boom, easing down the peak and throat, and hauling down the reef cringle to the boom by the reef-tackle; lash the tack and tie the points without rolling the slack canvas. The second and third reefs are taken in as the wind increases and the fore-sail reefed again or stowed, during which time the jib-sheet should be hauled flat, the main-tack triced up, and the vessel kept close to the wind to avoid plunging the sea over the bow. To reef the bow-sprit—house the top-mast, let the jib run in, slack the bobstays and bowsprit shrouds, take out the fid, and let the bowsprit run in one or two reefs; then refid it, set taut the gear, and set a small jib. It is at all times much more difficult to steer a short vessel than a long one, but especially in a heavy sea, when the mode of treatment must be entirely different. A small vessel should be luffed up to meet every large wave in order to bow it as much as possible. She will have but little way on at the time of meeting it and will drop into it easily; the bow will then fall off, the sails fill, and a run be made parallel to the waves till she is luffed up again. A four-oared gig has been taken through a heavy sea under oars by pulling up to meet every dangerous crest which could not be dodged, and just before it broke over the bow backing away from it. The smallest amount of sail which can be shown by a main-sail is when it is balance-reefed; this is accomplished by close-reefing it and lowering the jaws of the gaff close down to the boom, while the peak stretches up that part of the leech above the close-reef cringle. The plan is more frequently adopted by fishing smacks than by yachts or other well-found vessels; they have a try-sail which, being laced on a smaller gaff, is hoisted by the same peak and throat halyards as the larger sail, and has its sheet secured to a bolt near the stern, while the boom is crutched and secured with the main-sail and the large gaff lashed to it. The try-sail admits of being reefed; it is a safe sail either on or off the wind in rough weather. The greatest care is necessary when running before the wind to keep the vessel on her course and to avoid gybing. A vessel should never get under way without a small boat, and a cutter should never be without her legs for fear of taking the ground unexpectedly. In racing to windward, if the wind is variable, keep nearly dead to leeward of the mark vessel, as every change in the direction of the wind will then be an advantage; unless there is a tidal preference for one direction over the other, that will of course decide it.

If taken aback by a change of wind, and wishing to remain on the same tack, put the helm up and haul over the fore-sheet. In a ship haul over the head-sheets and brace the head-yards abox. The way to tack a ship under favorable circumstances may here be assumed as well known, and only a few hints relative to doubtful cases given. A few minutes prior to the attempt set all suitable sail, keep steadily "rap-full" with a small helm, so as to get as much way as possible. If the crew is large enough to list the ship, send them over to leeward, ease down the helm slowly, haul the boom in midships, haul down the head-sails, ease off the fore-sheet, let go the head-bowlines, and check the head-braces. Directly the wind is out of the fore-top-sail, brace the head-yards sharp up again and haul the bowlines. When the wind is entirely out of the main-top-sail, let go the top-gallant bowlines (if those sails are set) and raise tacks and sheets, except the fore-tack, which should be raised after the main-yard has been swung. As soon as the vessel loses her way, shift the helm hard over, and send the men to their stations. If she brings the wind across her bow, hoist the head-sails with the sheets on the same side as before; if the wind takes them well and the ship is still going round, give the order "main-sail haul," haul down the main-tack, aft the sheet, shift over the head-sails, haul the after-bowlines. As the main-top-sail fills, or before, according to the rapidity with which she pays off, swing the head-yards to the order of "haul off all."

If when near head to wind it is found that the bow is falling back and stern-way commencing, it is evident that she has "missed stays." The helm in that case should not be shifted, as with stern-way it will help her to pay her bow off in the direction it was before. The head-sails should be hoisted, the main-sail and spanker taken in, the fore-sheet hauled aft, the after-yards squared. As the wind comes abaft the beam the mizzen-top-sail should be kept shivering and the main-top-sail just full; shift the helm as she gathers headway. When before the wind square the head-yards, shift over the head-sheets, and keep them flowing. Set the spanker when it will take the right way; complete wearing as before described. This is similar to "box-hauling;" it is not necessary to brace the head-yards abox if she will fall off without. The maneuver of putting the helm down and letting the ship shoot up in the wind before wearing is sometimes adopted for the sake of diminishing the run to leeward. Hauling all the yards at once is very objectionable—the sails are longer aback and have to be hauled round by main strength against the pressure of the wind.

"Club-hauling" may occasionally save a ship even in these days of steam, as a paddle-steamer will not turn with her head against a strong gale and a heavy sea, nor will a sailing-ship with an auxiliary screw-propeller. It may be done when a ship is found edging down on a lee shore, too close to wear, and having a depth of water not exceeding twenty fathoms. It will take two or three minutes to open the hawse-pipe, get the cable clear, and procure hammer and punches for unshackling, and mauls for breaking the cable if necessary. Put the helm down and act as in ordinary tacking till she ceases to turn nearer to the wind; then let go the anchor.

whether she has entirely lost her way or not, as passing the anchor a little will give a greater swing back when the strain comes and allow more time for slipping the cable, which should be done directly the wind has crossed the bow; at the same time swing the after-yards. If the cable has been slipped successfully, the head-yards may be hauled as soon as the after-yards have been braced up, as she will soon be broadside on. It has been proposed to run a spring from the after-lee-port to the anchor, but that would take too much time.

"Backing and filling" is practiced in a tidal channel which is too narrow to allow a ship to gather way for tacking. One top-sail, with the jib and spanker occasionally, is generally sufficient to give slight head or stern way, to avoid either bank or another vessel, while the tide carries her broadside against the wind; the less sail exposed the less the lee-way. Fore-and-aft vessels having less power to get stern-way should have a boat in attendance with a line and a small anchor.

"Kedging" was a frequent performance before steam-tugs were introduced; it consisted of a series of movements from one small anchor to another, previously laid out by boats. For a similar purpose harbors that were much frequented were formerly furnished with a succession of warping buoys. The large ropes used for transporting ships are called hawsers, and by a strange anomaly were formerly cable-laid nine-stranded. Such rope is hard and stiff to handle; it absorbs more wet and retains it longer, therefore is less durable; when new the strength is far inferior to hawser-laid rope of similar size. Manila and coir hawsers float on the water and are therefore very useful.

Dropping through a narrow tidal channel by means of an anchor just touching the bottom is called "dredging" or clubbing; it can be practiced in a passage which is too narrow for backing and filling, such as the upper part of the Thames, where it is done every day. The vessel swings to her anchor and points her stern up (or down) the stream; by heaving in the cable (for which the steam capstans and windlasses afford great facility) the tide takes the ship on as fast as it is running so long as the course remains clear. When it is desirable to approach either side, a few fathoms of cable paid out will cause it to hold; the helm and the action of the tide will then sheer the ship as desired, and by heaving in cable she will go on again, so that a sailing-ship should go up at half the rate of the tide at least. With a screw-steamer it is far easier, as the screw will straighten her as well as the tide, and when fairly pointed through an open space she can make a stern-board at five knots an hour while perfectly under control.

A few words may be said about making and shortening sail in bad weather. One point holds good in all cases: the sails should never be allowed to flap, as that exposes them to the danger of splitting. The tack or luff is invariably secured first, while the sheet bears a steady strain enough to keep the sail from shaking. Before hoisting fore-and-aft sails the sheets are steadied aft; and, should a sheet carry away, the sail is hauled down or brailed up instantly. Spankers and try-sails should be taken in entirely by the lee-brails, the slack only of the weather-brails being at first taken down. A practice has become general in the British navy of securing the top-sail clew-line blocks to the lower cap instead of round the yard, for the sake of saving time when shifting top-sailyards; the use of the clew-lines for hauling the yard down and steadying it is thus lost; this is one of many objectionable practices.

There has been a difference of opinion as to the mode of setting and taking in top-sails and courses; but the same rule should apply to all square sails alike; that which is safest for one will be safest for the others. Experience and the balance of opinion favor the hauling home of the weather top-gallant-sheet, top-sail sheet, and tack of the fore-sail or main-sail first, with a good strain on the clew-lines, clew-garnets, and bunt-lines, to avoid flapping. The lee sheet may then be hauled and eased down by clew-line and bunt-line. Each bowline should also be steadied taut in succession to prevent the leech from flapping. There appears to be no advantage in first hauling the lee-sheet partially down. The taking in of these sails has been equally a matter of dispute, and many advocate taking in a top-sail in a different manner from that which they would adopt in taking in a course.

In taking in top-gallant-sails before the wind, both sheets should be kept fast till the yard is down. When a top-sail is to be reefed, the yard should be pointed to the wind; and for the first reef the top-gallant-sheets, bunt-line, and bowlines should be hauled taut, for the second reef the top-gallant-sail should be clewed up, to keep the sheets from knocking the men at the yard-arms. In rough weather a preventer parrel and rolling-tackle should be put on before the men go on the yards. For a fourth reef the top-sail should be clewed up during the operation; it will then be performed with less difficulty. The long reef-points in top-sails and courses have generally given place to the lighter and more expeditious method of having reef-lines on the sails, with beckets and toggles on the jackstay. The whole strain of the sail is thus thrown on the jackstay and small eyebolts, instead of the points being firmly tied round the yard itself. Also the slab of each reef is usually allowed to hang down and chafe at the fold; but this can be prevented by fastening three or four small slab-lines on each side of each reef. Cunningham's invention for reefing top-sails is very valuable in all weakly manned ships, but it requires to be kept square upon the yard while rolling up. If it becomes necessary to shift a top-sail during a gale, it should be made up on deck in the shape it would assume if furled on the yard, and stopped with spun-yarn, with the reef-earings and bowline bridles showing near the ends and the clews and bunt-line toggles near the center, where it would be slung by a slip-strop. When the two earings are taken into the center it will form four parts, and the weather top-mast studding-sail halyards being bent round it will cause it to look like a large bale. In that state it is hoisted into the top by the sail tackle, at the same time being steadied by the studding-sail halyards; there all the ropes are bent, clew-lines and bunt-lines hauled up, reef-tackles hauled out, and the sail bent to the yard before the stops are slipped or cut; then it is reefed as desired before the weather sheet is hauled home. A fore-sail or main-sail is bent in a similar manner, except that the various ropes employed on a course are bent on deck, by which ropes and the burtons it is swayed up. Studding sails are very useful in long voyages; their disuse on the main-mast is to be regretted, especially in long ships. A top-mast or top-gallant studding sail is shifted "before all," by a man on the yard gathering in the sail as it is lowered to him and holding the outer leech till it cants the right way.

During a coasting voyage the vessel must be within a moderate distance of the shore, therefore the person in charge should constantly be ready to run for shelter when necessary, and have the moral courage to do it in time. In yachting voyages, however distant, there is a natural desire to see the land and all that is worth seeing, and, being well provided with charts, such vessels can enter any harbor, when perhaps a pilot is not able to get out. A ship starting on a foreign voyage should seek "blue water" as soon as possible, and keep a safe distance from all land which is liable to become a lee shore, and not be tempted to edge in because a certain tack is much nearer to the desired course tnan the other. For the choice of track and for trade winds, see NAVIGATION.

To heave to for the purpose of stopping is done in a cutter by easing off the jib-sheet, hauling over the weather fore-sheet, and tricing up the tack of the mainsail. A schooner is treated similarly: the top-sail (if she has one) is backed and the gaff-fore-sail is taken in. A ship has her courses hauled up, head-sheets eased off, and either the main or fore yard squared. Upon the latter point opinions differ. If two ships are close together, the one to windward had better back the main-top-sail and the ship to ieeward the fore-top-sail; they should always preserve a little headway. Boats invariably board ships on the lee side; small vessels, when drifting fast, on the weather side. A ship at anchor in a tide-way will always present a lee side during some period; but a "weather tide" causes a dangerous sea for boats. A boat's oars should never be tossed up or forward when there is danger of their fouling, for fear of staving the boat or injuring some one in the after part.

When in the vicinity of a lee beach and landing by means of a boat is determined on, the oars should be manned to the utmost and the waves watched (as they always vary), and the boat forced in on the top of the third large wave, care being taken to keep her exactly end on to the sea. At the instant of touching the ground every man should jump out and begin to haul up the boat, if she is of reasonable weight; the next wave will probably put them all out of danger. By holding on to the boat they give and receive mutual support, and avoid being sucked back by the receding water or crushed by the boat. The violent rolling motion may sometimes be diminished by altering course, so that the period between the waves reaching the vessel may be made to disagree with her own period of oscillation, or when running before the wind by bracing the yards up in opposite directions. Steamers at a reduced speed can scarcely be considered as hove to; their masts and sails are too weak to be of any use in a gale and too small in moderate winds; they make the rudder do all the work. The best sail to scud under is close-reefed main-top-sail, reefed fore-sail, and fore-top-mast stay-sail.

SEAMEN, LAWS RELATING TO. In most legal systems legislation has interfered to protect the seaman from the consequences of that imprudence which is generally supposed to be one of his distinguishing characteristics. In the United Kingdom there has been a very large amount of legislation dealing with the interests of seamen with unusual fullness of detail, proving the care bestowed by a maritime power upon those to whom its commercial success is so largely due. How far this legislation has had the efficiency which was expected may be doubtful. The law of the United States relating to seamen in the navy will be found in the articles for the government of the navy. Legislation in the interests of merchant seamen dates from 1790. A list of the crew must be delivered to a collector of customs. The shipping articles are the same as those in use in the United Kingdom. For vessels in the coasting trade they are, with certain exceptions, to be in writing or in print. They must, in the case of foreign-bound ships, be signed before a shipping commissioner appointed by the circuit court or a collector of customs, or (if entered into abroad) a consular officer, where practicable, and must be acknowledged by his signature in a prescribed form. One-third of a seaman's wages earned up to that time is due at every port where the ship unlades and delivers her cargo before the voyage is ended. They must be fully paid in gold or its equivalent within twenty days of the discharge of the cargo. Advance notes can be made only in favor of the seaman himself or his wife or mother. There is a summary remedy for wages before a district court, a justice of the peace, or a commissioner of a district court. A shipping commissioner may act as arbitrator by written consent of the parties. Seaworthiness is an implied condition of the hiring. There may be an examination of the ship on the complaint of the mate and a majority of the crew. The expenses of an unnecessary investigation are a charge upon the wages of those who complain. A seaman may not leave his ship without the consent of the master. For foreign-bound voyages a medicine-chest and antiscorbutics must be carried, also 60 gallons of water, 100 pounds of salted meat, and 100 pounds of wholesome bread for every person on board, and for every seaman at least one suit of woolen clothing, and fuel for the fire of the seaman's room. An assessment of 40 cents per month per seaman is levied on every vessel arriving from a foreign port and on every registered coasting vessel in aid of the fund for the relief of sick and disabled seamen. In the navy a deduction of 20 cents per month from each man's pay is made for the same purpose.

SEARCH, RIGHT OF. "The right of visiting and searching ships on the high seas," says Lord Stowell, "whatever be the ships, whatever be the cargoes, whatever be the destinations, is an incontestable right of the lawfully commissioned ship of a belligerent nation; because till they are visited and searched it does not appear what the ships or the cargoes or the destinations are; and it is for the purpose of ascertaining these points that the necessity of this right of visitation and search exists. This right is so clear in principle that no man can deny it who admits the right of maritime capture, because if you are not at liberty to ascertain by sufficient inquiry whether there is property which can be legally captured, it is impossible to capture." This right of search or visitation and search has not been at all times recognized. The second armed neutrality of the Baltic powers in 1800 attempted to withdraw their vessels from the right. The bombardment of Copenhagen in 1801 was one of the results of this policy. Since the convention which followed that event the right has been regarded as established within proper limits, and is often regulated by treaty, especially as to the search of vessels suspected of being engaged in the slave trade. Resistance by a neutral vessel, whether alone or in convoy, renders her liable to capture according to the English and United States doctrine. But most Continental authorities lay down that the declaration of the officer in charge of the convoy is to be accepted, and that a refusal to accept such declaration may justify the convoy in resisting search.

The right of search is historically interesting, as on two occasions it has brought Great Britain into collision with the United States. One of the causes of the war of 1812 was the right then claimed (but since abandoned) by Great Britain of searching vessels of the United States for British subjects serving in them as seamen, with a view to impressing them for the royal navy. In 1861 the British mail steamer *Trent* was stopped on the high seas by a United States ship of war, and Messrs. Slidell and Mason, two commissioners of the Confederate States proceeding to Europe, were taken out of her and afterward imprisoned in the United States. On diplomatic representations being made at Washington by the ambassadors of Great Britain and other powers the commissioners were released, and a war was avoided. The affair of the *Trent* settled definitely a controversy long pending between the United States and Great Britain. England had claimed the right of searching neutral vessels in war, for the alleged purpose of ascertaining if any subjects were on board, so that she might take them out and secure from them the military service due her. This claim was founded on the doctrine that no other country could ever claim the allegiance of an Englishman. The United States denied this right, the war of 1812 occurring as stated, on account of it. In the negotiations following the *Trent* seizure the British government committed itself to a definite abandonment of doctrine and right. There remains, nevertheless, under the Law of Nations, a right to search vessels at sea under given circumstances, principally applying to suspected piracy, being engaged in the slave trade, or defrauding the revenue.

SEA-SERPENT. The belief in enormous serpents, both terrestrial and marine, dates from very early times. Pliny, following Livy, tells us of a land-serpent 120 feet long, which Regulus and his army besieged with balistæ, as though it had been a city, and this story is repeated by several other writers. The most prolific in accounts of the sea-serpent, however, are the early Norse writers, to whom the "Sö-Orm" was a subject for both prose and verse. Olaus Magnus describes it as 200 feet long and 20 feet round, and states that it not only ate calves, sheep, and swine, but also "disturbs ships, rising up like a mast, and, sometimes snaps some of the men from the deck," illustrating his account with a vivid representation of the animal in the very act. Pontoppidan, in his *Natural History*, says that its existence was generally believed in by the sailors and fishermen of his time, and recounts the means they adopted to escape it, as well as many details regarding the habits of the creature. The more circumstantial records of comparatively modern times may be most conveniently grouped according to the causes which presumably gave rise to the phenomena described. (1) A number of porpoises swimming one behind another may, by their characteristic mode of half emerging from and then reëntering the water during respiration, produce the appearance of a single animal showing a succession of snake-like undulations. The figure given by Pontoppidan was very likely suggested by such an appearance, and a sketch of an animal seen off Llandudno by several observers looks as though it might have had a similar origin, notwithstanding that this hypothesis was rejected by them. (2) A flight of sea-fowl on one occasion recorded by Professor Aldis produced the appearance of a snake swimming at the surface of the water. (3) A large mass of seaweed has on more than one occasion been cautiously approached and even harpooned under the impression that it was such a monster. (4) A pair of basking sharks (*Selache maxima*) furnish an explanation of some of the recorded observations, as was first pointed out by Frank Buckland. These fish have a habit of swimming in pairs, one following the other with the dorsal fin and the upper lobe of the tail just appearing above the water, and, as each animal is fully thirty feet long, the effect of a body of sixty or more feet long moving through the water is readily produced. To this category belongs the famous serpent cast up on Stronsay, one of the Orkneys, of which an account was read to the Wernerian Society of Edinburgh; some of its vertebræ were preserved in the Royal College of Surgeons of London, and identified as those of *Selache maxima* by both Home and Owen. There is also evidence to show that specimens of *Carcharodon* must have existed more than 100 feet long. (5) Ribbon-fish (*Regalecus*), from their snake-like form and great length (sometimes as much as twenty feet) have been suggested as the origin of so-called "sea serpents," among others by Dr. Andrew Wilson; but Doctor Günther, from what is known regarding the habits of these fish, does not regard this theory as tenable. (6) A gigantic squid (*Architeuthus*) was most likely the foundation of the old Norse accounts, and also of those which in the early part of the nineteenth century originated so frequently in the United States as to gain for the animal the sobriquet of "American sea serpent." These stories were so circumstantial and on the whole so consistent, and vouched for by persons of such eminence, that no doubt was possible (notwithstanding the caviling of Mitchell) as to the existence of a strange marine monster of very definite character in those regions. The description commonly given of it has been summed up by Gosse somewhat thus:—(i.) general form that of a serpent; (ii.) length averaging sixty feet; (iii.) head flattened, eye generally not mentioned, some distinctly stating that it was not seen; (iv.) neck twelve to sixteen inches in diameter; (v.) appendages on the head, neck, or back (accounts here variable); (vi.) color dark, lighter below; (vii.) swims at the surface, head thrown forward and slightly elevated; (viii.) progression steady and uniform, body straight but capable of being bent; (ix.) water spouting from it; (x.) in shape like a "nun buoy."

SEA-SICKNESS, a peculiar set of symptoms experienced by many persons when subjected to the pitching and rolling motion of a vessel at sea, of which depression, giddiness, nausea, and vomiting are the most prominent.

Although the vast majority of persons appear to be liable to this ailment on exposure to its exciting cause (the instances of complete and constant immunity being rare), they do not all suffer alike. Many endure distress of a most acute and even alarming kind, while others are simply conscious of transient feelings of nausea and discomfort. In long voyages, while many are affected with sea-sickness for the first few days only, others are tormented with it during the entire period, especially on the occurrence of rough weather. In short voyages, such as across the English Channel, not a few even of those susceptible escape, while others suffer in an extreme degree, the sickness persisting long after arrival on shore.

Innumerable preventives and remedies have been proposed; but most of them fall far short of the success claimed for them. No means has yet been discovered which can altogether prevent the occurrence of sea-sickness, nor is it likely any will be found, since it is largely due to the pitching movements of the vessel, which cannot be averted. Swinging couches or chambers have not proved of any practical utility. No doubt there is less risk of sickness in a large and well-ballasted vessel than in a small one; but, even though the rolling may be considerably modified, the ascending and descending movements which so readily produce nausea continue. None of the medicinal agents proposed possess infallible properties: a remedy which suits one person will often wholly fail with another. There appears to be a wide concurrence of opinion that nerve sedatives are among the most potent drugs which can be employed; and full medicinal doses of bromide of potassium, chloral, or opium (the last two only under strict medical direction) taken before sailing appear to act usefully in the case of many persons. On the other hand, some high authorities have recommended the employment of nerve stimulants, such as a small cupful of very strong coffee to be taken about two hours before sailing, which will frequently prevent or mitigate the sickness. When the vessel is in motion, or even before starting, the recumbent position with the head low and the eyes closed should be assumed by those at all likely to suffer, and, should the weather admit, on deck rather than below—the body, especially the extremities, being well covered. Many persons, however, find comfort and relief from lying down in their berths with a hot bottle to the feet, by which means sleep may be obtained, and with it a temporary abatement of the distressing giddiness and nausea. Should sickness supervene small quantities of some light food, such as thin arrowroot, gruel, or soup, ought to be swallowed if possible, in order to lessen the sense of exhaustion, which is often extreme. The vomiting may be mitigated by saline effervescing drinks, ice, chloroform, hydrocyanic acid, or opium. Alcohol, although occasionally useful in great prostration, is not generally found to be of much service, but tends rather to aggravate the sickness. Doctor Chapman, in accordance with his view of the cause of the sickness, introduced a spinal ice-bag, which has been extensively employed and recommended; but, like every other plan of treatment, it has only occasional success. The more recently proposed remedies, such as nitrite of amyl and cocaine, do not seem to yield any better results than the agents already mentioned.

SEATTLE, a leading city of the newly organized State of Washington, and capital of Kings county, is located on Seattle Harbor or Elliott Bay, Puget Sound. The city was founded in 1852 by New Yorkers, and was named in honor of Seattle, the most powerful Indian chief of that region. Since 1880, the almost phenomenal growth of Seattle has furnished additional evidence of the enterprise indigenous to western civilization, and the almost unlimited extent of western resources. It is also located at the junction of the Seattle, Lake Shore, and Eastern, with its two branches the Columbia and Puget Sound and the Puget Sound Shore roads, with the Northern Pacific, and is preeminently the center and headquarters for more than one-half of the steamers plying Puget Sound and the tributaries thereto. In addition to these mediums of communication the city is provided with fully twenty-five miles of electric and cable roads, and as many more miles are now (1890) under construction, all radiating from the center of the city and reaching to the furthest outlying districts. In the matter of churches each denomination is represented by one or more organizations, and there are many costly and elegant church buildings. Its educational system is of the highest standard. The city is the location of the Washington State University, also of a female seminary, the latter conducted under the auspices of the Catholic Church, while the public schools afford the fullest complement of advantages for securing an education. During 1889, the average attendance at the Seattle schools was 3,529. The city contains eleven banks with an aggregate capital of $3,950,000, there having been an increase of $900,000 capital and $2,015,000 in deposits since October, 1888. In addition to four daily papers, there are a number of well managed weeklies, and all branches of commercial endeavor are well represented, while manufacturing enterprises are extensively carried on, and labor, both skilled and unskilled, receives liberal compensation.

On June 6, 1889, a disastrous fire occurred in which sixty-five acres of improvements, the business heart of the city, were burned over, entailing losses aggregating more than ten millions of dollars. Another extensive conflagration visited the city in May, 1890, but in spite of these repeated calamities, the city's growth and development have not been checked, and not a single failure of business has occurred in consequence. The city is the center of a rich agricultural, mining, and lumber region, and the ventures for the further improvement of the city and vicinity, including a navy yard at Port Orchard, across the bay, projected and determined upon, give assurances of a still more prosperous career in the near future. The population, 3,000 in 1880, has since been steadily increasing, and at present (1890) is represented to be 42,837.

SEA WATER. The ocean covers very nearly eight-elevenths of the total area of the globe; its average depth may be estimated as 2,000 fathoms, and its total mass at 1.322×10^{18} (*i.e.*, 1.3 million million millions) tons. Its general configuration must be assumed to have been substantially the same as it is now for thousands of years; hence we may safely conclude that the absolute composition of the ocean as a whole is constant in the sense of being only subject to very slow progressive millennial variation, and that, taking one part of the ocean with another, the percentage composition of the fixed part of the *solutum* can oscillate only within narrow limits. The composition of this solutum is very complex. According to Forchhammer, ocean salt in addition to the chlorides and sulphates of sodium, magnesium, potassium, and calcium—which had long been known to be its principal components—includes silica, boric acid, bromine, iodine, fluorine as acid, and the oxides of nickel, cobalt, manganese, aluminium, zinc, silver, lead, copper, barium, and strontium as basic components. Arsenic, gold, lithium, rubidium, cæsium have been discovered since Forchhammer wrote. But all these subsidiary components, as that investigator found, amount to very little—so little that in his numerous quantitative analyses of waters which he had procured from all quarters of the globe he confined himself to the determination of the chlorine, sulphuric acid, magnesia, lime, potash, and soda. The soda, however, he determined only by difference, assuming that the muriatic and sulphuric acids are united with the bases into perfectly neutral salts. As a general result he found that, in the open ocean, the ratio to one another of the several acids and bases named is subject to only slight variations. But his samples had all been collected at the surface; the potash had been determined by an insufficiently exact method; and the assumed neutrality of the total salt had not been proved. With the view primarily of supplementing Forchhammer's work, Dittmar made complete analyses of seventy-seven of the samples brought home by the *Challenger* so selected that thirty-four out of the seventy-seven represented depths of 1,000 fathoms or more. His analyses brought out a small surplus of base, proving the presence of carbonate in all the waters; but the numerical values thus found for the "alkalinity," being charged with the observational errors of the whole series of determinations, could not be relied on. Dittmar therefore subsequently availed himself of a very easy and yet exact method for the direct determination of this quantity, which meanwhile had been discovered by Tornöe, and applied it to over 130 *Challenger* samples. He besides made a special inquiry into the relation between the quantity of lime and the depth at which the water had been collected, and a similar inquiry in regard to the bromine. As a general summary he gives the following three tables. The total salts contained in ocean water amount on an average to about 3.5 per cent., thus leaving 96.5 per cent. for the water proper:

TABLE I.—*Average Composition of Ocean-Water Salts.*

	Per 100 parts of Total Salts.	Per 100 of Halogen calculated as Chlorine.	
	Dittmar.	Dittmar.	Forchhammer.
Chlorine	55.292	99.848	Not determined.
Bromine	0.188	0.340	Not determined.
Sulphuric acid, SO_3	6.410	11.576	11.88
Carbonic acid, CO_2	0.152	0.274	Not determined.
Lime, CaO	1.676	3.026	2.93
Magnesia, MgO	6.209	11.212	11.03
Potash, K_2O	1.332	2.405	1.93
Soda, Na_2O	41.234	74.462	Not determined.
(Basic oxygen, equivalent to the halogens)	(−12.493)	(−22.559)	....
Total Salts	100.000	180.584	181.1

TABLE II.—*Results from combining Acids and Bases* (Dittmar).

Chloride of sodium	77.758	Sulphate of potash	2.465
Chloride of magnesium.	10.878	Bromide of magnesium.	0.217
Sulphate of magnesium	4.737	Carbonate of lime	0.345
Sulphate of lime	3.600		
		Total salts	100.000

Reducing to the absolute mass of the ocean as given above, we arrive at the following numbers.

TABLE III.—*Absolute Composition of the Salts of the Ocean.*

Unit = 1 million million = 10^{12} tons.

Chloride of sodium	35,990	Sulphate of potash	1,141
Chloride of magnesium	5,034	Bromide of magnesium	100
Sulphate of magnesium.	2,192	Carbonate of lime	160
Sulphate of lime	1,666		
			46,283

Total bromine....................87.2 (Dittmar).
Total iodine...................... 0.03 (Kottstorfer).
Total chloride of rubidium.......25.0 (C. Schmidt).

SEA-WOLF, also SEA-CAT and WOLF-FISH (*Anarrhichas lupus*), a marine fish, the largest kind of the family *Blenniidæ* or Blennies. In spite of its large size, it has retained the bodily form and general external characteristics of the small blennies, which are so abundant on every rocky part of the coast. Its body is long, subcylindrical in front, compressed in the caudal portion, smooth and slippery, the rudimentary scales being embedded and almost hidden in the skin. An even dorsal fin extends along the whole length of the back, and a similar fin from the vent to the caudal fin, as in blennies. But its formidable dentition distinguishes the sea-wolf from all the other members of the family. Both jaws are armed in front with strong conical teeth, and on the sides with two series of large tubercular molars, a biserial band of similar molars occupying the middle of the palate. By these teeth the sea-wolf is able to crush the hard carapaces or shells of the crustaceans and mollusks on which it feeds; but whether it uses the teeth as a weapon of defense and deserves the character of ferocity generally attributed to it, would appear to be rather questionable from observations made on specimens in the aquarium at Hamburg, which allowed themselves to be handled without in any way resenting the loss of their liberty. It must, however, be added that the small blennies bite readily when caught. Sea-wolves are inhabitants of the northern seas of both hemispheres, one (*A. lupus*) being common on the coast of Scandinavia and North Britain, and two in the seas round Iceland and Greenland. Two others occur in the corresponding latitudes of the North Pacific. They attain to a length exceeding six feet, and in the north are esteemed as food, both fresh and preserved. The oil extracted from the liver is said to be in quality equal to the best cod-liver oil. Of late years small numbers have reached the English markets, where, however, the prejudice which attaches to all scaleless fishes, particularly such as possess a varied pattern of coloration, limits their use as food.

SEBASTE. See SIVAS.

SEBASTIAN, DOM. See PORTUGAL.

SEBASTIAN, ST., the patron saint against plague and pestilence, was by birth a Narbonese. According to the Roman breviary his nobility and bravery had endeared him to the emperor Diocletian, who made him captain of the first cohort. Having secretly become a Christian, he was wont to encourage those of his brethren who in the hour of trial seemed wavering in their profession. This was conspicuously the case when the brothers Marcus and Marcellinus were being led forth to death; by his exhortations he prevailed on them to resist the entreaties and tears of their wives and children. The emperor having been informed of this conduct sent for him and earnestly remonstrated with him, but, finding him inflexible, ordered that he should be bound to a stake and shot to death. After the archers had left him for dead a devout woman, Irene, came by night to take his body away for burial, but finding him still alive, carried him to her house, where his wounds were dressed. No sooner had he wholly recovered than he hastened to confront the emperor, reproaching him with his impiety; Diocletian, filled with astonishment, which soon changed into fury, ordered him to be instantly carried off and beaten to death with rods (288). The sentence was forthwith executed, his body being thrown into the cloaca, where, however, it was found by another pious matron, Lucina, whom Sebastian visited in a dream, directing her to bury him in the Catacombs under the site of the church now called by his name. He is celebrated by the Roman Church on January 20th (duplex). His cult is chiefly diffused along the eastern coast of Italy and in other districts liable to visitations of plague. As a young and beautiful soldier, he is a favorite subject of sacred art, being most generally represented as undraped and severely, though not mortally, wounded with arrows.

SEBASTIANO DEL PIOMBO, painter, was born at Venice in 1485, and belongs to the Venetian school, exceptionally modified by the Florentine or Roman. His first painting of note was done for the church of St. John Chrysostom in Venice, and is so closely modeled on the style of Giorgione that in its author's time it often passed for the work of that master. Toward 1512 Sebastiano was invited to Rome by the wealthy Sienese merchant Agostino Chigi, who occupied a villa by the Tiber, since named the Farnesina; he executed some frescoes here, other leading artists being employed at the same time. Four leading pictures which Sebastiano painted are the *Pietà* (earliest of the four), in the church of the Conventuali, Viterbo; the *Transfiguration* and the *Flagellation*, in the church of S. Pietro in Montorio, Rome; and, most celebrated of all, the *Raising of Lazarus*, now in the London National Gallery. This grand work—more remarkable for general strength of pictorial perception than for qualities of detailed intellectual or emotional expression—is more than twelve by nine feet in dimensions, with the principal figures of the natural size; it is inscribed "Sebastianus Venetus faciebat," and was transferred from wood to canvas in 1771. It was painted in 1517–19 for Giulio de' Medici, then bishop of Narbonne, afterward Pope Clement VII.

After the elevation of Giulio de' Medici to the pontificate, the office of the "piombo" or leaden seal—that is, the office of sealer of briefs of the apostolic chamber—became vacant; two painters competed for it, Se bastiano Luciani, hitherto a comparatively poor man, and Giovanni da Udine. Finally Sebastiano, assuming the habit of a friar, secured the very lucrative appointment—with the proviso, however, that he should pay out of his emoluments 300 scudi per annum to Giovanni. If he had heretofore been slow in painting, he became now supine and indifferent in a marked degree. One of the few subject-pictures which he executed after taking office was *Christ carrying the Cross* for the patriarch of Aquileia, also a *Madonna* with the body of Christ. Late in life Sebastiano had a serious disagreement with Michelangelo with reference to the Florentine's great picture of the *Last Judgment*. Sebastiano encouraged the pope to insist that this picture should be executed in oil. Michelangelo, determined from the first upon nothing but fresco, tartly replied to his holiness that oil was only fit for women and for sluggards like Friar Sebastian; and the coolness between the two painters lasted almost up to the friar's death. This event, consequent upon a violent fever acting rapidly upon a very sanguine temperament, took place at Rome in 1547.

SEBASTOPOL, or Sevastopol, the chief naval station of Russia on the Black Sea, is situated in the southwest of the Crimea, in 44° 37′ N. latitude and 33° 31′ E. longitude, 935 miles from Moscow, with which it is connected by rail *via* Kharkoff. Before the Crimean War of 1853–56 Sebastopol was a well-built city, beautified by gardens, and had 43,000 inhabitants; but at the end of the siege it had not more than fourteen buildings which had not been badly injured. After the war many privileges were granted by the government in order to attract population and trade to the town; but both increased slowly, and at the end of seven years its population numbered only 5,750. In 1826 strong fortifications were begun, and in 1853 it was a formidable fortress. In September, 1854, after having defeated the Russians in the battle of the Alma, the Anglo-French laid siege to the southern portion of the town, and on October 17th began a heavy bombardment. Sebastopol, which was nearly quite open from the land, was strengthened by earthworks thrown up under the fire of the besiegers, and sustained a memorable eleven months' siege. On September 8, 1855, it was evacuated by the Russians, who retired to the north side. The fortifications were blown up by the allies, and by the Paris treaty the Russians were bound not to restore them.

In November, 1870, during the Franco-German War, the Russian Government publicly threw off the obligation of those clauses of the treaty of Paris which related to the Black Sea fleet and fortresses, and it was decided again to make Sebastopol a naval arsenal. In 1882 Sebastopol had a population of 26,150 inhabitants, largely military. The town has been rebuilt on a new plan, and a fine church occupies a prominent site. There are now two lyceums and a zoölogical marine station. Although belonging to the government of Taurida, Sebastopol and its environs are under a separate military governor.

SEBENICO (*Sibenik*), a town of Austrian Dalmatia, on the coast of the Adriatic, about half-way between Zara and Spalato, is situated on an irregular basin at the mouth of the Kerka, connected with the sea by a winding channel three miles long. Fishing is carried on extensively. The population of the commune in 1880 was 18,104, of the town proper about 8,000.

SECCHI, Angelo, Italian astronomer, was born on June 29, 1818, at Reggio in Lombardy, and entered the Society of Jesus at an early age. In 1849 he was appointed director of the observatory of the Collegio Romano, which was rebuilt in 1853; there he devoted himself with great perseverance to researches in physical astronomy and meteorology till his death at Rome on February 26, 1878.

SECKENDORF, Veit Ludwig von, a German statesman and scholar of the seventeenth century, was born at Herzogenaurach (near Erlangen) in Upper Franconia, December 20, 1626. His youth fell in the midst of the Thirty Years' War, in which his father was actively engaged. But his talented and noble mother carefully watched over his education. In 1652 he was appointed to important judicial positions and sent on weighty embassages. In 1656 he was made judge in the ducal court at Jena. In 1692 he was appointed chancellor of the new university of Halle, but died a few weeks afterward, on December 18th.

SECRETARY BIRD, a very singular African species, first accurately made known from an example living in the menagerie of the Prince of Orange, in 1769, by Vosmaer, in a treatise published in Dutch and French, and afterward included in his collected works. The Secretary bird is of remarkable appearance, standing nearly four feet in height, the great length of its legs giving it a resemblance to a crane or a heron; but the expert will at once notice that, unlike those birds, its tibiæ are feathered all the way down. From the back of the head and the nape hangs, loosely and in pairs, a series of black elongated feathers, capable of erection and dilation in periods of excitement. The skin round the eyes is bare and of an orange color. The head, neck, and upper parts of the body and wing coverts are bluish-gray; but the carpal feathers, including the primaries, are black, as also are the feathers of the vent and tibiæ—the last being in some examples tipped with white. The tail quills are gray for the greater part of their length, then barred with black and tipped with white; but the two middle feathers are more than twice as long as those next to them, and drooping downward present a very unique appearance.

The habits of the Secretary-bird have been very frequently described, one of the best accounts of them being by Verreaux in the Zoölogical Society's *proceedings* for 1856. Its chief prey consists of insects and reptiles, and as a foe to snakes it is held in high esteem. Making every allowance for exaggeration, it seems to possess a strange partiality for the destruction of the latter, and successfully attacks the most venomous species, striking them with its knobbed wings and kicking forward at them with its feet, until they are rendered incapable of offense, when it swallows them. The nest is a huge structure, placed in a bush or tree, and in it two white eggs, spotted with rust-color, are laid. The young remain in the nest for a long while, and even when four months old are unable to stand upright. They are very frequently brought up tame, and become agreeable not to say useful pets about a house, the chief drawbacks to them being that when hungry they will help themselves to the small poultry, and the fragility of their legs, which follows on any sudden alarm, and ends in their death. The Secretary-bird is found, but not very abundantly and only in some localities, over the greater part of Africa, especially in the south, extending northward on the west to the Gambia and in the interior to Khartum, where Von Heuglin observed it breeding.

SECULAR GAMES were celebrated at Rome for three days and nights with great ceremony to mark the commencement of a new *sæculum* or generation. Originally they were a propitiatory festival, imported from Etruria under the name of Ludi Terentini, and held at irregular intervals, in view of extraordinary prodigies; but in 249 B.C. it was decreed that they should be celebrated in every hundredth year after that date. This decree was frequently disregarded, partly for political reasons and partly because in Augustus' time and with his approval the quindecemviri, acting under Greek influence, sanctioned the longer period of 110 years.

SECUNDERÁBÁD, one of the chief British military cantonments in India, is situated in the native state of Haidarábád (Hyderabad) or the Nizam's Dominions, in 17° 26′ 30″ N. latitude, and 78° 33′ E. longitude, 1,830 feet above the level of the sea, and 6 miles northeast of Haidarábád city. The strength of the military force stationed at Secunderábád in 1883 was 5,632, European troops numbering 2,276 and native troops 3,356. To the southwest of the cantonment there is a large reservoir or tank, known as the Husain Ságar, about three miles in circumference. Secunderábád town, which forms the cantonment bazaar, contains a population of over 30,000.

SECUNDUS, JOHANNES, or JOHANN EVERTS, Latin poet, was born at The Hague on November 10, 1511, and died in 1536.

SEDAINE, MICHEL JEAN, dramatist, was born at Paris on July 4, 1719. Sedaine, who became a member of the Academy, secretary for architecture of the fine arts division, and a prosperous man generally, was personally both popular and respected. He lived to a considerable age, dying at Paris on May 17, 1797.

SEDALIA is a leading and representative city of Missouri, and capital of Pettis county. It is located on the main-line of the Missouri Pacific railroad, at the junction of the Missouri, Kansas and Texas, and Sedalia, Warsaw and Southwestern divisions of that system, in the development of which the city has long been a potent factor—centrally situated, within a few hours ride of St. Louis, Kansas City, Boonville, and Fort Scott, also the shipping point for the agricultural and mining products of the surrounding country. Sedalia gives promise of growth and prosperity that must be more than realized in the near future. The city contains a court-house and other county buildings, an opera house, theater, and other places of public resort, all of which are commodious and handsomely appointed, half-a-dozen hotels, two daily and four weekly papers, two national banks, a high-school building costing $50,000; also accommodations for the intermediate, grammar and primary departments of the system of education employed, nine churches, and many stores and warehouses utilized for commercial purposes. The manufactures embrace flouring mills, iron foundries, farming implements, machinery, wagons, and railway cars and appliances. The machine and repair-shops of the Missouri Pacific system are located here. The city is lighted by gas and electricity, and employs the Holly system of water supply. The population in 1870 was 4,560; in 1880, 9,561; and in 1890 (United States census), 14,068.

SEDAN, a town of France, the chef-lieu of an arrondissement in the department of Ardennes, lies on the right bank of the Meuse, thirteen miles east-southeast of Mezières by the railway to Thionville (Lorraine), and is surrounded by heights of about 1,000 feet. The population was 13,807 in 1872, and 19,240 in 1881 (19,556 in the commune).

On September 1, 1870, the fortress was the center of the most disastrous conflict of the Franco-German War. Shut in by the Germans, who had occupied the surrounding heights, the whole French army, after a terrific contest, was obliged to capitulate—the emperor, 39 generals, 230 staff-officers, 2,600 officers, and 83,000 men becoming prisoners of war. The village of Bazeilles was the scene of the heroic stand made by the marines under Martin des Pallières.

SEDDON, THOMAS, landscape painter, was born in London, August 28, 1821. His father was a cabinet-maker, and the son for some time followed the same occupation; but in 1842 he was sent to Paris to study ornamental art. On his return he executed designs for furniture for his father, and, in 1848, gained a silver medal from the Society of Arts. In the following year he made sketching expeditions in Wales and France, and, in 1852, began to exhibit in the Royal Academy, sending a figurepiece, Penelope, and afterward landscapes, deriving their subjects from Brittany. In October, 1856, Seddon visited Cairo, where, after a very brief illness, he died November 23.

SEDGWICK, ADAM, English geologist, was born in 1785 at Dent, Yorkshire. In 1818 he succeeded Professor Hailstone in the Woodwardian chair of geology. In 1834 he published a *Discourse on the Studies of the University of Cambridge*, which reached a fifth edition. Having taken holy orders, he was advanced to the dignity of canon of Norwich cathedral, and for some time also he was vice-master of Trinity College. Sedgwick died at Cambridge, January 25, 1873.

SEDITION, in Roman law, was considered as *majestas* or treason. In English law it is a very elastic term, including offenses ranging from libel to TREASON, (*q.v.*) It is rarely used except in its adjectival form, *e.g.*, seditious libel, seditious meeting, or seditious conspiracy. "As to sedition itself," says Mr. Justice Stephen, "I do not think that any such offense is known to English law."

In the Acts of Congress the word "sedition" appears to occur only in the army and navy articles. A soldier joining any sedition or who, being present at any sedition, does not use his utmost endeavor to suppress the same, is punishable with death. A sailor uttering seditious words is punishable at the discretion of a court-martial. In 1798 an Act of Congress called the Sedition Act was passed, which expired by effluxion of time in 1801. Its constitutionality was violently assailed at the time. Several prosecutions under the Act will be found in Wharton's *State Trials.* Sedition is also dealt with by the State laws mostly in a very liberal spirit. Thus the Louisiana Code, § 394, enacts that "there is no such offense known to our law as defamation of the government or either of its branches, either under the name of libel, slander, seditious writing, or other appellation." By § 111, to constitute the offense of sedition, "there must be not only a design to dismember the State, or to subvert or change its constitution, but an attempt must be made to do it by force."

SEDLEY, SIR CHARLES, a noted "wit" and patron of literature in the Restoration period, the "Lisideius" of Dryden's *Essay of Dramatic Poesy.* He was born in 1639, the son of Sir John Sedley of Aylesford in Kent. Sedley died on August 20, 1701.

SEDUCTION. The action for seduction of an unmarried woman in England stands in a somewhat anomalous position. The theory of English law is that the woman herself has suffered no wrong; the wrong has been suffered by the parent or person *in loco parentis*, who must sue for the damage arising from the loss of service caused by the seduction of the woman. Some evidence of service must be given, but very slight evidence will be sufficient. Although the action is nominally for loss of service, still exemplary damages may be given for the dishonor of the plaintiff's family beyond recompense for the mere loss of service. An action for seduction cannot be brought in the county court except by agreement of the parties. As to seduction of a married woman, the old action for criminal conversation was abolished by the Divorce Act, 1857, which substituted for it a claim for damages against the co-respondent in a divorce suit. Seduction in England is not as a rule a criminal offense. But a conspiracy to seduce is indictable at common law.

United States.—In the United States, State legislation has generally modified the common law. In some States the father brings the action as the representative of the family whose purity has been invaded; in others the woman herself may bring the action. In many States there is a criminal as well as a civil remedy. The penal codes of New York, New Jersey, Louisiana, and other States make it a crime to seduce under promise of marriage an unmarried woman of good reputation. Subsequent intermarriage of the parties is in most cases a bar to criminal proceedings. Massachusetts goes still further. By the law of that State, if a man commits fornication with a single woman, each of them shall be punished by imprisonment not exceeding three months, or by fine not exceeding $30. The seduction of a female passenger on a vessel of the United States is an offense punishable by fine or imprisonment. The fine may be ordered by the court to be paid to the person seduced or her child (Act of Congress of March 24, 1860). The State legislation of the United States is in remarkable opposition to the rule of the canon law, by which the seduction of a woman by her betrothed was not punishable on account of the inchoate right over her person given by the betrothal.

SEDULIUS, Cœlius, a Christian poet of the fifth century, was the author of an abecedarian *Hymnus de Christo* in iambic dimeters, portions of which maintain their ground in the offices of the Church of Rome. Of his personal history nothing is known, except that he is called a presbyter by Isidore, of Seville; by some other writers of less authority he is designated "antistes" or "episcopus." A Scoto-Irish origin has sometimes been claimed for him; but at all events he must not be confounded with Sedulius the grammarian, an Irish Scot who lived in the ninth century.

SEDUM. About 120 species are enumerated in this genus of *Crassulaceæ*, mostly perennial herbs with succulent leaves of varied form, but never compound. The individual flowers are usually small and grouped in cymes. In color they range from white and yellow to pink. They have a calyx of five sepals, as many petals, usually ten stamens, and five distinct carpels, which have as many glands at their base and ripen into as many dry seed-pods. Several species are British, including some with tuberous roots and large leaves (*Telephium*), and others of smaller size, chiefly found on rocks, walls, and dry banks. Many are cultivated for the beauty of their flowers, and many are remarkable for their prolonged vitality under adverse circumstances. Sedums are very closely allied to Sempervivums.

SEELAND. See Zealand.

SÉES, a town of France and a bishop's see, in the department of Orne, is situated on the Orne, four miles from its source and thirteen miles north of Alençon by the railway from Le Mans to Caen. The population of Sées was 3,483 in 1881, and that of the commune 4,687.

SEETZEN, Ulrich Jasper, one of the most distinguished of modern travelers in the East, was born the son of a yeoman, in the little lordship of Jever in German Frisia, on January 30, 1767. His chief exploit was a tour round the Dead Sea, which he made without a companion and in the disguise of a beggar. From Egypt he went by sea to Jeddah and reached Mecca as a pilgrim in October, 1809. In Arabia he made extensive journeys, ranging from Medina to Lahak and returning to Mocha, from which place his last letters to Europe were written, in November, 1810. In September of the following year he left Mocha with the hope of reaching Muscat, and was found dead two days later, having, it is believed, been poisoned by the command of the imám of Sana'a.

SE-GAN FOO, the capital of the province of Shen-se in northwestern China, is situated in 34° 17′ N. latitude and 108° 58′ E. longitude. Its walls are little inferior in height and massiveness to those of Peking, while its gates are handsomer and better defended than any of which the capital can boast. The population is said to be 1,000,000, of whom 50,000 are Mohammedans.

SEGESTA, a very ancient city near the northwestern extremity of Sicily, so named by the natives and by the Romans, while the Greeks called it Egesta or Ægesta. Its origin was ascribed by tradition sometimes to Trojan refugees and sometime to Phocians, followers of Philoctetes; the accounts agree only in making Segesta older than the Greek colonization of Sicily in the seventh century B.C. Its site is now deserted, having been exposed to the Saracen depredations in the tenth century; but the ruins are very fine.

SEGOVIA, a province of Spain, formerly part of Old Castile, is bounded on the north and northeast by the provinces of Burgos and Soria, on the southeast by those of Guadalajara and Madrid, on the southwest by Avila, and on the northwest by Valladolid. It has an area of 2,670 square miles, and the population in 1889 was 159,961. The chief trades and manufactures formerly carried on in the province—weaving, tanning, making of earthenware, etc.—have been drawn away to more commercial centers. Paper-making holds its own to some extent, owing to the excellence of the water; and for the same reason, together with the superior quality of the breed of sheep, the picturesque scenes attendant upon the preparation of the fleeces may still be witnessed. Such prosperity, however, as Segovia retains is dependent upon its agricultural produce—wheat, rye, barley, peas, hemp, flax, etc.—together with the rearing of sheep, cattle, mules, and pigs. The sierras yield excellent granite, marble, and limestone; but hitherto the difficulty of transport has prevented any development of mineral wealth.

Segovia, the capital of the above province, clusters upon a narrow ridge of rock which rises in the valley of the Eresma, where this river is joined by its turbulent little tributary the Clamores, and is one of the best specimens extant of the Gotho-Castilian cities. Segovia finally lost its ancient prosperity when it was taken and sacked by the French in 1808. Some insignificant manufactories of cloth, leather, paper, and rude earthenware still exist in the suburb of San Lorenzo, but the trade of the place languishes year by year. The city is the see of a bishop suffragan to Valladolid. The population in 1889 was 13,000.

SEIGNORY, or Seigniory, is the relation of the lord of a fee or a manor to his tenant. There is no land in England without its lord: "Nulle terre sans seigneur" is the old feudal maxim. Where no other lord can be discovered the crown is lord as lord paramount. The principal incidents of a seignory were fealty and rent-service. In return for these privileges the lord was liable to forfeit his rights if he neglected to protect and defend the tenant, or did anything injurious to the feudal relation. Every seignory now existing must have been created before the Statute of *Quia Emptores*, which forbade the future creation of estates in fee-simple by subinfeudation.

SEINE. This, one of the chief rivers of France (Lat., *Sequana*), rises on the eastern slope of the plateau of Langres, eighteen miles to the northwest of Dijon. It keeps the same general direction (northwestward) throughout its entire course, but has numerous windings; between its source and its mouth in the English Channel the air distance is only 250 miles, but that actually traversed (through the departments of Côte-d'Or, Aube, Seine-et-Marne, Seine-et-Oise, Seine, Eure, and Seine-Inférieure) is 482. Though shorter than the Loire, and inferior in volume to the streams of the Rhone system when these are at their fullest, the Seine derives an exceptional importance from the regularity of its flow. This feature is due to the geological character of its basin, an area of 19,400,000 acres, entirely belonging to France (with the exception of a few communes in Belgium), and formed, in three-fourths of its extent, of permeable strata, which absorb the atmospheric precipitation to restore it gently to the river by perennial springs. It is believed that the Seine never attains a volume so high as 90,000 cubic feet per second. At Paris its average per second is 9,000, and after it has received all its tributaries it ranges between 24,000 and 25,000 cubic feet. At Paris it falls as low as 2,650 cubic feet, and in exceptional droughts the figure of 1,200 has been reached. During the flood of 1876, which lasted fifty-five days, the volume between the quays at Paris rose to 58,600 cubic feet per second.

SEINE, the department of France which has Paris as its chief town, was formed in 1790 of part of the province of Île-de-France. It lies between 48° 44′ and 48° 58′ N. latitude and 2° 10′ and 2° 34′ E. longitude, and is entirely surrounded by the department of Seine-et-Oise, from which it is separated at certain parts by the Seine, the Marne, and the Bièvre. The area of the department is only 118,306 acres, and of this surface a seventh or a sixth is occupied by Paris; the suburban villages also are close together and very populous. In actual population (2,799,329 in 1881) as well as in density (23.7 persons per acre), it holds the first place. Flowing from southeast to northwest through the department, the Seine forms three links: on the right it receives above Paris the Marne, and below Paris the Rouillon, and on the left hand the Bièvre within the precincts of the city. The left bank of the Seine is in general higher than the right and consists of the Villejuif and Chatillon plateaus separated by the Bièvre; the highest point (568 feet) is above Chatillon and the lowest (105) at the exit of the Seine. Below Paris the river flows between the plain of Gennevilliers and Nanterre (commanded by Mont Valérien) on the left and the plain of St. Denis on the right. On the right side, to the east of Paris, are the heights of Avron and Vincennes commanding the course of the Marne. Communication is further facilitated by various canals.

SEINE-ET-MARNE, a department of northern France, was formed in 1790 of almost the entire district of Brie (half of which belonged to Champagne and half to Île-de-France) and a portion of Gâtinais (from Île-de-France and Orléanais). Lying between 48° 7′ and 49° 6′ N. latitude and 2° 23′ and 3° 13′ E. longitude, it is bounded north by the departments of Oise and Aisne, east by Marne and Aube, south by Yonne and Loiret, and west by Seine-et-Oise. The climate is rather more "continental" than that of Paris—the summers warmer, the winters colder; the annual rainfall does not exceed sixteen inches. There is a striking difference between the south of the department, where the famous white grape (*chasselas*) of Fontainebleau ripens, and the country to the north of the Marne—this river marking pretty exactly the northern limit of the vine.

With its 348,991 inhabitants in 1881, Seine-et-Marne is in density of population slightly below the average of France. It has 5 arrondissements, 29 cantons, 530 communes, forms the diocese of Meaux, belongs to the jurisdiction of the Paris court of appeal, and to the district of the Orleans *corps d'armée.*

SEINE-ET-OISE, a department of northern France, formed in 1790 of part of the old province of Île-de-France, and traversed from southeast to northwest by the Seine, which is joined by the Oise from the right. Lying between 48° 17′ and 49° 14′ N. latitude and 1° 27′ and 2° 37′ E. longitude, it is surrounded by the departments of Seine-et-Marne on the east, Loiret on the south, Eure-et-Loir on the west, Eure on the northwest, and Oise on the north. The most important industrial establishments are the national porcelain factory at Sèvres; the government powder-mills of Sevran and Bouchet; the paper-mills and cardboard mills (1,570 workmen) of Corbeil (population 6,566 in 1881) Étampes (7,465), and Pontoise (6,675), but by far the largest is at Essonne (4,999); the flax-spinning mills (6,368 spindles), cotton-mills (17,830 spindles), silk-mills (5,726), wool-mills (8,890); the foundries and boat and bridge building yards at Argenteuil (10,167); the engineering and railway works at Corbeil, etc.; the agricultural implement factories at Dourdan (2,819); the sugar-refineries with thousands of workmen; distilleries on most of the large farms; starch-works, laundries, large printing establishments close to Paris; factories for chemical products, candles, embroidery, hosiery, perfumery, shoes, and buttons; one of the finest zinc-works in France; saw-mills, etc. Besides the navigation of the Seine, the Marne, the Oise, and the Canal d'Ourcq, the department has 420 miles of railroad, 457 of national roads, and 3,958 of other roads. The population of the department in 1881 was 577,798 inhabitants (one and a half times the average density of the French departments). There are 6 arrondissements, 37 cantons, and 686 communes; the department forms the diocese of Versailles, is divided between the *corps d'armée* of Amiens, Rouen, Le Mans, and Orleans, and has its court of appeal at Paris.

SEINE INFÉRIEURE, a department of the north of France, formed in 1790 of four districts (Norman Vexin, Bray, Caux, and Roumois) belonging to the province of Normandy. Lying between 49° 15′ and 50° 4′ N. latitude, and 1° 52′ and 0° 4′ E. longitude, it is bounded northwest and north by the English Channel for a distance of eighty miles, northeast by Somme, from which it is separated by the Bresle, east by Oise, south by Eure and the estuary of the Seine, which separates the department from Calvados.

With a total area of 1,491,458 acres, Seine Inférieure has 911,938 acres of arable ground, 151,125 of wood, 99,703 grass, 32,977 moorland and pasturage. Out of a total population of 814,068 in 1881 those dependent on agriculture numbered 233,536. The live stock in the same year comprised 81,561 horses of good breeds, 1,421 asses, 125 mules, 236,493 cattle, 259,677 sheep of ordinary kinds and 27,523 of special breeds (wool-clip 560 tons), 78,186 pigs, 3,341 goats, 13,202 beehives (54 tons of honey and 13 of wax). Milch cows are kept in great numbers, and Gournay butter and Gournay and Neufchâtel cheese are in repute. The farms of the Caux plateau are each surrounded by an earthen dyke, on which are planted forest trees, generally beech and oak. Within the shelter thus provided apple and pear trees grow, which produce the cider generally drunk by the inhabitants. The other crops in 1883 were—wheat, 6,667,650 bushels; meslin, 59,950; rye, 654,489; barley, 443,751; oats, 7,017,609; potatoes, 2,954,457; pulse, 98,736; beetroot for sugar 28,837 tons, and for fodder 118,099; colza seed, 29,076 tons; and 457,047 tons of ordinary fodder. In general the department is fertile and well cultivated. With the exception of a little peat and a number of quarries, employing 745 workmen, Seine Inférieure has no mineral source of wealth; but manufacturing industry is well developed. Rouen is the chief center of the cotton-trade, which is in the department represented by 190 spinning and weaving factories, employing 22,947 hands, 1,400,000 spindles, 14,000 power-looms, and 4,000 hand-looms, and working up 30,000 tons of cotton annually. Hand-loom weaving, carried on throughout the country districts, employs 18,000 looms; in the branch of the cotton trade known as *rouennerie* 190 manufacturers are employed, producing to the value of $12,000,000 per annum; in that of the *indiennes* 20 establishments with 5,000 workpeople turn out yearly 1,000,000 pieces of 115 yards each. There are 22 establishments for dyeing cotton cloth with 700 workmen, and for dyeing cotton yarn 32 establishments with 1,200 workmen. The woolen manufacture, of which Elbeuf is the center, employs 24,000 workmen and produces goods valued at about $17,500,000, with raw material valued at $8,600,000, mainly imported from Australia and partly from the La Plata ports. The wool-spinning mills (at Elbeuf and Darnétal) have 92,000 spindles, and there are 650 power-looms and 3,800 hand-looms. At Elbeuf (22,883 inhabitants in 1881) there are 17 dyeworks, 50 twist factories, a manufactory of carding machines, and 45 cloth-dressing factories. About 18,000 spindles are employed in flax-spinning, an industry more widely distributed throughout the department. Engineering works, foundries, and iron shipbuilding yards occur at Havre (population 105,540 in 1881) and Rouen (105,860). Wooden ships are also built at Havre, Rouen, Dieppe (21,585), and Fécamp (11,919). Other establishments of importance are the national tobacco factories at Dieppe (1,100 hands) and Havre (580 hands), sugar-refineries ($7,200,000 worth of sugar in 1881), glass-works (873 workmen), soap-works, chemical works, candle-factories, flour-mills, oil-factories, ivory-works, lace-works, clock-factories, etc. The total number of industrial establishments in the department is 975; and it is estimated that 305,460 persons depend on industrial pursuits. The fisheries are a great resource for the inhabitants of the seaboard. The principal ports for foreign trade are Havre, Rouen, and Dieppe. There are 364 miles of railway, 370 of national roads, 6,543 of other roads, 98 of Seine navigation, and the Bresle is canalized for two miles. In population Seine Inférieure stands fourth in the list of French departments.

SEISIN. "Seisin of the freehold may be defined to be the possession of such an estate in land as was anciently thought worthy to be held by a free man." Seisin is now confined to possession of the freehold, though at one time it appears to have been used for simple possession without regard to the estate of the possessor. Its importance is considerably less than it was at one time owing to the old form of conveyance by feoffment with livery of seisin having been superseded by a deed of grant, and the old rule of descent from the person last seised having been abolished in favor of descent from the purchaser.

SEISMOMETER. This name was originally given to instruments designed to measure the movement of the ground during earthquakes. Recent observations have shown that, in addition to the comparatively great and sudden displacements which occur in earthquakes, the ground is subject to other movements. Some of these, which may be called "earth-tremors," resemble earthquakes in the rapidity with which they occur, but differ from earthquakes in being imperceptible (owing to the smallness of the motion) until instrumental means are used to detect them. Others, which may be called "earth-tiltings," show themselves by a slow bending and unbending of the surface, so that a post stuck in the ground, vertical to begin with, does not remain vertical, but inclines now to one side and now to another, the plane of the ground in which it stands shifting relatively to the horizon. No sharp distinction can be drawn between these classes of movements. Earthquakes and earth-tremors grade into one another, and in almost every earthquake there is some tilting of the surface. The term "seismometer" may conveniently be extended (and will here be understood) to cover all instruments which are designed to measure movements of the ground.

Measurements of earth-movements are of two distinct types. In one type, which is applicable to ordinary earthquakes and earth-tremors, the thing measured is the displacement of a point in the earth's crust. In the second type, which is applicable to slow tiltings, the thing measured is any change in the plane of the earth's surface relatively to the vertical.

Inertia Method.—In the first type of measurements what may be called the "inertia" method is followed. A mass is suspended with freedom to move in the direction of that component of the earth's motion which is to be measured. When an impulse occurs the supports move, but the mass is prevented by its inertia from accompanying them. It supplies a steady point, to be used as a standard of reference in determining the

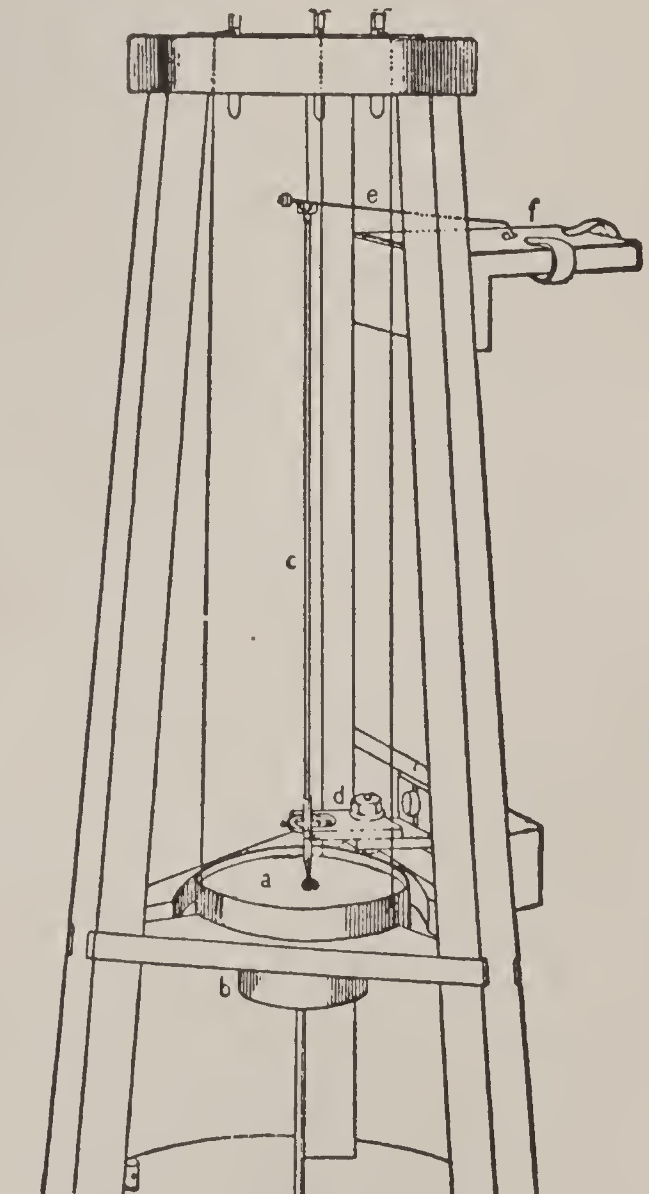


Fig. 1.—Duplex pendulum seismograph.

extent through which the ground has moved in the direction in question. But, in order that the suspended mass shall not acquire motion when its supports move, one essential condition must be satisfied. Its equilibrium must be neutral, or nearly so, in order that, when the supports are displaced, little or no force may be brought into operation tending to bring the mass into the same position relative to the supports as it occupied before disturbance. This can be made plain by considering the case of a common pendulum hung from a support which is rigidly fixed to the ground. When the ground moves in any horizontal direction the pendulum's inertia causes a certain point in it (the center of percussion) to remain for the instant at rest. But this contrivance does not yield a steady point, because the stability of the pendulum makes the bob swing down to recover its place directly under the support; and in fact, if a succession of oscillations of the ground occur, the bob acquires a motion often much greater than the motion of the support itself. This tendency may be corrected, and the pendulum made fit to act as a seismometer, by any contrivance which (without introducing friction) will reduce its stability so much as to make the equilibrium of the bob very nearly neutral. In all instruments designed to furnish a steady point the suspended mass must have some small stability, else it would be unmanageable; but its period of free oscillation must be much greater than that of the earthquake-motions which it is employed to measure. Even a simple pendulum can have its stability reduced sufficiently to fit it for seismometric work by making it very long. The same result is, however, much more conveniently achieved by combining a common pendulum with an inverted pendulum placed just beneath it. The common pendulum being stable and the inverted pendulum unstable, if the bobs are jointed so that they must move together, the combination can be made as nearly astatic as may be desired. Figs. 1 and 2 illustrate how this combination is applied in seismometry. The stable bob *a*, hung from a fixed support above by three parallel wires, is connected with the inverted pendulum *b* by a ball-and-tube joint. A lever *c*, carried by a gimbal joint in the fixed bracket *d*, is geared also by a ball-and-tube joint to the upper bob. Its long arm carries a jointed index *e*, which projects out and touches a smoked-glass plate *f*, held on a fixed shelf. Any horizontal motion of the ground acts on the lever by the bracket *d*, and causes the index to trace a magnified record on the smoked-glass plate. Fig. 1 is taken from a photograph of an instrument of this kind, constructed to give a much magnified record of small movements. When large earthquakes are to be recorded the multiplying lever is dispensed with, and the index is attached directly to one of the bobs. Observations with instruments of this class exhibit well the very complicated motion which the earth's surface undergoes during an earthquake. In small earthquakes (such as are only slightly or not at all destructive) the greatest amplitude of motion is often less than a millimetre, and rarely more than a centimetre; the disturbance nevertheless consists of a multitude of successive movements, quite irregular in amplitude, period, and direction. Fig. 3 is a fac simile of the record given by a duplex pendulum seismograph during one of the earthquakes which occur frequently in the plain of Yedo, Japan. The record, as engraved, is three and a half times the earth's actual motion. Instead of two pendulums, a single inverted pendulum has been used, with a spring stretched between it and a fixed support above. By adjusting the spring so that a proper proportion of the weight is borne by it and the remainder by the rigid stem of the pendulum, an approach to neutral equilibrium can be made. In Forbes' inverted pendulum seismometer a somewhat similar plan was adopted: the foot of the pendulum was attached to an elastic wire which tended to restore it to its normal vertical position when displaced.

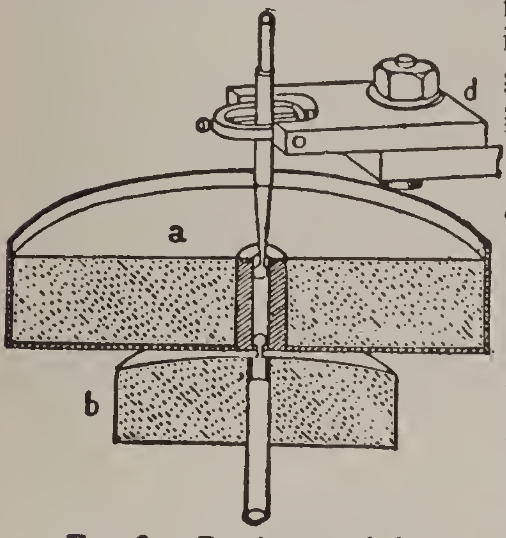


Fig. 2.—Duplex pendulum showing details.

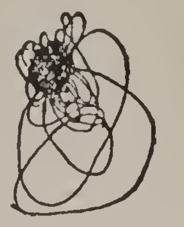


Fig. 3.—Record of earthquake motion.

Another group of instruments designed to furnish two degrees of freedom for the purpose of recording all motions in a horizontal plane, but much less satisfactory on account of their friction, is that in which a rolling sphere either itself supplies inertia or forms a support for a second inertia-giving mass. Probably the earliest was one used in Japan by Dr. G. F. Verbeck in 1876 (see fig. 4). On a marble table, ground plane and carefully leveled, four balls of rock-crystal were placed, carrying a massive block of hard wood. A pencil, sliding in a hole in the block, registered the relative motion of the table and the block on a sheet of paper fixed below. The motion registered is (or would be, if there were no friction) somewhat larger than the true motion of the table, for the system is kinetically equivalent to four upright pieces whose centers of percussion lie in a plane nearly, but not quite, as high as the tops of the balls. This forms what may be called the steady plane; its position depends on the relative masses of block and balls, and is easily calculated. When the ground moves in any direction the block moves through a short distance in the opposite direction, and the record is magnified in a fixed ratio. There are other forms of seismometer, but these two described may be taken as typical both in construction and in principle.

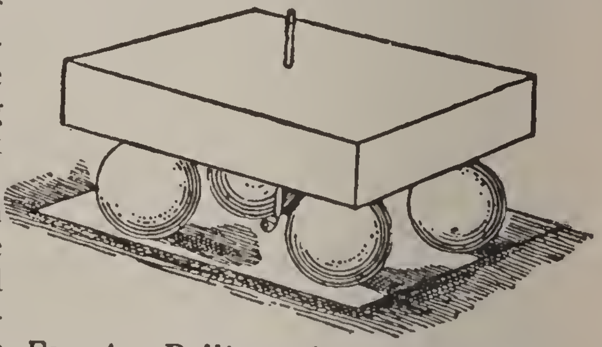
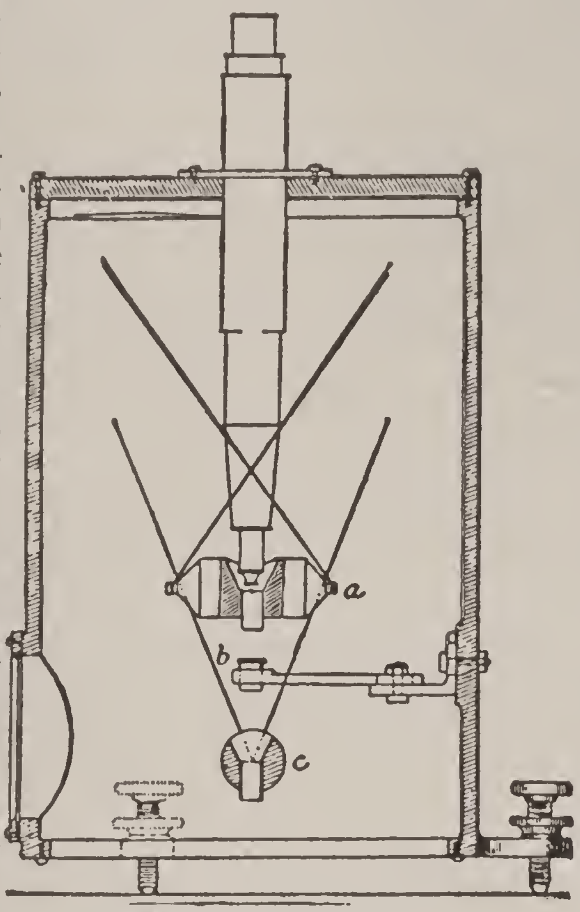


Fig. 4.—Rolling sphere seismograph.

The seismographs which have been described draw a horizontal plan of the path pursued during an earthquake by a point on the earth's surface. They take no note of the relation of the displacement of time—an element which is required if we are to form any estimate of the violence of an earthquake from the record. With this view a different method of registration is also followed. The whole movement is resolved into rectilinear components, and these are separately recorded (by single-freedom seismometers) on a plate or drum which is kept in continuous movement, so that the record of each component takes the form of an undulating line, from which the number, succession, amplitude, velocity, and acceleration of the component movements can be deduced and the resultant motion determined. A single steady mass with two degrees of freedom may still be employed to record, separately, two components of horizontal motion; but it is generally preferable to provide two distinct masses, each with one degree of freedom. The principal instrument of this class is the horizontal pendulum seismograph, which has been used to record Japanese earthquakes since 1880. It consists of two horizontal pendulums, set at right angles to each other, each supplying a steady point with respect to horizontal motions transverse to its own length. Each pendulum is pivoted about two points, on an axis which is nearly vertical, but inclined slightly forward to give a suitable degree of stability. In some forms of the instrument the pivoted frame of the pendulum is light, and the inertia is practically all furnished by a second piece or bob pivoted on the frame about a vertical axis through the center of percussion of the frame. This construction has the advantage of compactness and of making the position of the steady point at once determinate. But a simpler construction is to attach the bob rigidly to the frame. This shifts the steady point a little way outward from the position it would have if the bob were pivoted. In either construction a prolongation of the pendulum beyond the bob forms a convenient multiplying index.

The instruments which have been described afford complete and satisfactory means of determining the motion which a point of the ground undergoes during any disturbance which would be recognized as an earthquake. For minute earth-tremors, however, a larger multiplication is necessary, and the absence of friction is of even more importance than in the measurement of earthquakes proper. Optical methods of magnifying the motion are accordingly resorted to. In the "normal trommometer" of Bertelli, used in Italy to detect earth-tremors, the bob of a pendulum, suspended by a fine wire from a fixed support, is viewed through a reflecting prism, and its motion in any azimuth measured by a micrometer microscope. The great stability of the pendulum, which is only 1½ meters long, prevents it from behaving as a steady-point seismometer; and, if successive earth-movements were by chance to occur with a period equal or nearly equal to its own free period, its acquired swing would altogether mask the legitimate indications. This kind of action has, in fact, been turned to account as a means of detecting very minute earth-tremors by Rossi, who has devised a micro-seismoscope, consisting of a number of pendulums of various lengths, one or other of which is likely to be set swinging when the ground shakes to and fro repeatedly, through even the minutest range. To measure tremors, however, the instruments of Bertelli and Rossi are inappropriate; for that purpose, just as for the purpose of measuring larger motions, the suspended mass must be in nearly neutral equilibrium. To find a mode of suspension which is at once astatic and extremely frictionless is a matter of some difficulty; the crossed-link suspension, which has been already described, is probably the most satisfactory means hitherto suggested. It has been adopted in the micro-seismometer sketched in section in accompanying figure. Two bobs are separately suspended at right angles to each other, one above the other, in a cast-iron case. A microscope, fixed to the top of the case and furnished with a micrometer eyepiece, is focused on a hair, which is stretched transversely across a vertical tube in the upper bob *a*. This serves to measure horizontal motion in the plane of the drawing. Motion at right angles to this is shown by the lower bob *c* (drawn in section), which carries a similar transverse hair. A fixed lens *b* between the bobs gives an image of the lower hair in the plane of the upper hair, so that both appear crossed in the field of the microscope, thereby allowing both components of horizontal motion to be observed together.



Microseismometer.

SEISTAN. See SISTAN.

SEJANUS, ÆLIUS (executed 31 A.D.), the famous minister of TIBERIUS, (*q.v.*)

SELBY, a market town of the West Riding of Yorkshire, England, is situated on the navigable river Ouse and on the main line of the Great Northern Railway, fifteen miles south of York and twenty east of Leeds. The population of the urban sanitary district (6,193 in 1871), extended in 1881 from 514 to 3,760 acres, was in that year 6,057.

SELDEN, JOHN, jurist, legal antiquary, and Oriental scholar, was born on December 16, 1584, at Salvington, in the parish of West Tarring, near Worthing, Sussex, England. In 1603 he was admitted a member of Clifford's Inn, London, and in 1604 migrated to the Inner Temple, and in due course he was called to the bar.

It was as a scholar and writer that Selden won his reputation both among his contemporaries and with posterity. His first work, an account of the civil administration of England before the Norman Conquest, is said to have been completed when he was only two or three-and-twenty years of age. But if this was *Analecton Anglo-Britannicon*, as is generally supposed, he withheld it from the world until 1615. In 1610 appeared his *England's Epinomis* and *Janus Anglorum*, *Facies Altera*, which dealt with the progress of English law down to Henry II., and *The Duello*, or *Single Combat*, in which he traced the history of trial by battle in England from the Norman Conquest. In 1613 he supplied a series of notes, enriched by an immense number of quotations and references, to the first eighteen cantos of Drayton's *Polyolbion*. In 1614 he published *Titles of Honor*, which, in spite of some obvious defects and omissions, has remained to the present day the most comprehensive and trustworthy work of its kind that we possess; and in 1616 his notes on Fortescue's *De Laudibus Legum Angliæ* and Hengham's *Summæ Magna et Parva*. In 1617 his *De Diis Syriis* was issued from the press and immediately established his fame as an Oriental scholar among the learned in all parts of Europe. After two centuries and a half, indeed, it is still not only the fundamental but also in many respects the best book which has been written on Semitic mythology. In 1618 his *History of Tithes*, although only published after it had been submitted to the censorship and duly licensed, nevertheless aroused the apprehension of the bishops and provoked the intervention of the king. The author was summoned before the privy council and compelled to retract his opinions, or at any rate what were held to be his opinions.

In 1623 he was returned to the House of Commons for the borough of Lancaster, and sat with Coke, Noy, and Pym on Sergeant Glanville's election committee.

He was also nominated reader of Lyon's Inn, an office which he declined to undertake.

In 1646 he subscribed the Solemn League and Covenant, and in 1647 was voted £5,000 ($25,000) by the parliament as compensation for his sufferings in the evil days of the monarchy. He had not, however, relaxed his literary exertions during these years. He published in 1642 *Privileges of the Baronage of England when they sit in Parliament* and *Discourse concerning the Rights and Privileges of the Subject;* in 1644 *Dissertatio de Anno Civili et Calendario Reipublicæ Judaicæ;* in 1646 his treatise on marriage and divorce among the Jews entitled *Uxor Ebraica;* and in 1647 the earliest printed edition of the old and curious English law-book *Fleta.* What course he adopted with regard to the trial and execution of the king is unknown; but it is said that he refused to answer the *Eikon Basilike,* although Cromwell was anxious he should do so, the task which he declined being afterward performed by Milton in his *Iconoclastes.* In 1650 Selden passed the first part of *De Synedriis et Prefecturis Juridicis Veterum Ebræorum* through the press, the second and third parts being severally published in 1653 and 1655, and in 1652 he wrote a preface and collated some of the manuscripts for Sir Roger Twysden's *Historiæ Anglicæ Scriptores Decem.* His last publication was a vindication of himself from certain charges advanced against him and his *Mare Clausum* in 1653 by Theodore Graswinckel, a Dutch jurist.

After the death of the earl of Kent in 1639 Selden lived permanently under the same roof with his widow. It is believed that he was married to her, although their marriage does not seem to have ever been publicly acknowledged. He died at Friary House in Whitefriars on November 30, 1654, and was buried in the Temple Church, London. Within the last few years a brass tablet has been erected to his memory by the benchers of the Inner Temple in the parish church of West Tarring.

SELECTION AND VARIATION. See VARIATION AND SELECTION.

SELENIUM AND TELLURIUM are two rather rare chemical elements discovered, the latter by Müller von Reichenstein in 1782, the former by Berzelius in 1817. Both occur only in the mineral kingdom as components of very rare minerals, most of which are compounds of one or the other of both, and sulphur with silver, lead, bismuth, antimony, gold, and other metals.

Elementary Selenium.—This, like elementary sulphur, exists in a variety of forms, which are conveniently considered as modifications of the two genera now to be described. (1) *Non-metallic selenium* includes the flocculent scarlet precipitate produced by the reduction of solution of selenium by sulphurous acid in the cold. The scarlet flocks when dried without the aid of heat, assume the form of a brown-red powder of sp. gr. 4.26, which dissolves in 1,000 times its weight of boiling bisulphide of carbon, (at 46.6° C.) The solution on cooling deposits most of its selenium in the form of minute monoclinic crystals of sp. gr. 4.5 (isomorphous with monoclinic sulphur), which retain their solubility in bisulphide of carbon up to 100° C. (2) *Metallic selenium* is a dark gray or black solid of 4.8 sp. gr.; it exhibits metallic luster, stretches perceptibly under the hammer, and its fracture is similar to that of gray cast iron. It is insoluble in bisulphide of carbon. Its fusing point is sharply defined, and lies at 217° C. At the ordinary temperature it conducts electricity, while the non-metallic modification does not; at higher temperatures, or after temporary exposure to higher temperatures, the conductivity on either side becomes an eminently variable quantity.

Elementary Tellurium.—This, the compact form, is a silver-white resplendent metal of markedly crystalline structure; the crystals are rhombohedra, and the ingot consequently is very brittle. Specific gravity 6.2. The metal fuses at about 500° C., and is distillable at very high temperatures. Its vapor is golden yellow and has a very brilliant absorption spectrum. Tellurium becomes feebly electrical when rubbed with a woolen cloth. The electric conductivity, like that of selenium, is largely influenced by the temperature and previous exposure to heat, and it increases after exposure to light, though not to the same extent as selenium does. Starting from the ordinary temperature the conductivity decreases up to some point between 90° and 145° C.; it then increases up to 200° C (the highest temperature tried); on cooling it decreases steadily, and finally is only one-fifth or one-sixth of what it was at 200°. The numerical value at 200° (silver=100) was found equal to 0.0035 to 0.0031 (F. Exner).

SELEUCIA, or SELEUCEIA (Σελεύκεια). Of the numerous ancient towns of this name the most famous are—(1) the great city on the Tigris founded by Seleucus I. Nicator; (2) a city on the northern frontier of Syria toward Cilicia, some miles north of the mouth of the Orontes, also founded by Seleucus I., and forming with Antioch, Apamea, and Laodicea the Syrian Tetrapolis.

SELEUCIDS. See MACEDONIAN EMPIRE and PERSIA.

SELIM, or SALIM, the title borne by three emperors of the Ottoman Turks. For SELIM I., emperor from 1512 to 1520, see PERSIA and TURKEY. SELIM II., grandson of the preceding, was sultan from 1556 to 1574. See TURKEY. SELIM III., son of Sultan Mustapha III., succeeded his father in 1789 and was deposed in 1807. See TURKEY.

SELIMNIA. See SLIVEN.

SELINUS (Σελινοῦς), one of the most important of the Greek colonies in Sicily, near the rivers Hypsas and Selinus on the southwest coast, was founded, probably, about 628 B.C., by colonists from Megara Hyblæa, in the east of Sicily, and others from the parent city of Megara, on the Saronic Gulf of Greece (see Thuc., vi. 4, vii. 57, and Strabo, vi. p. 272). The name of the city and the little river on which it stands was derived from the wild parsley (σέλινον) which grew there in abundance.

SELJÚKS is the name of several Turkish dynasties, issued from one family, which reigned over large parts of Asia in the 11th, 12th, and 13th centuries of our era. The history of the Seljúks forms the first part of the history of the Turkish empire.

The first Seljúk rulers were Toghrul Beg, Chakir Beg, and Ibrahím Niyál, the sons of Mikail, the son of Seljúk, the son of Tukák (also styled Timúryálik, "iron bow"). They belonged to the Turkish tribe of the Ghuzz (Οὖζοι of Const. Porphyr. and the Byzantine writers), which traced its lineage to Oghuz, the famous eponymic hero not only of this but of all Turkish tribes.

The province of Kermán was one of the first conquests of the Seljúks, and became the hereditary fief of Káwurd, the son of Chakir Beg.

The Seljúkian dynasty of Syria came to an end after three generations, and its later history is interwoven with that of the crusaders. The first prince was Tutush, who perished, after a reign of continuous fighting, in battle against Barkiyárok near Rai (1095). Of his two sons, the elder, Ridhwán, established himself at Aleppo (died 1113); the younger, Dukak, took possession of Damascus, and died in 1103. The sons of the former, Alp Arslán and Sultán Sháh, reigned a short time nominally, though the real power was exercised by Lúlú till 1117. We cannot, however, enter here into the very complicated history of these two cities, which changed their masters almost every year till the time of Zengi and Núr ed-dín.

After the great victory of Alp Arslán, in which the Greek emperor was taken prisoner (1071), Asia Minor lay open to the inroads of the Turks. Hence it was easy for Sulaimán, the son of Kutulmish, the son of Arslán Pígu (Israil), to penetrate as far as the Hellespont, the more so as after the captivity of Romanus, two rivals, Nicephorus Bryennius in Asia and another Nicephorus named Botoniates in Europe, disputed the throne with one another.

Afterward there arose a rivalry between the Seljúks and the Danishmand, which ended with the extinction of the latter about 1175. Kilig Arslán took possession of Mosul in 1107, and declared himself independent of the Seljúks of 'Irak; but in the same year he was drowned in the Chaboras through the treachery of his own emirs, and the dynasty seemed again destined to decay, as his sons were in the power of his enemies. The sultan Mohammed, however, set at liberty his eldest son Malik Sháh, who reigned for some time, until he was treacherously murdered (it is not quite certain by whom), being succeeded by his brother Mas'úd, who established himself at Konieh (Iconium), from that time the residence of the Seljúks of Rúm. During his reign—he died in 1155—the Greek emperors undertook various expeditions in Asia Minor and Armenia; but the Seljúk was cunning enough to profess himself their ally and to direct them against his own enemies. Nevertheless the Seljúkian dominion was petty and unimportant and did not rise to significance till his son and successor, Kilig Arslán II., had subdued the Danishmands and appropriated their possessions, though he thereby risked the wrath of the powerful atabek of Syria, Nur ed-dín, and afterward that of the still more powerful Saladin. But as the sultan grew old his numerous sons, who held each the command of a city of the empire, embittered his old age by their mutual rivalry, and the eldest, Kotb ed-dín, tyrannized over his father in his own capital, exactly at the time that Frederick I. (Barbarossa) entered his dominions on his way to the Holy Sepulcher (1190). Konieh itself was taken and the sultan forced to provide guides and provisions for the crusaders. Kilig Arslán lived two years longer, finally under the protection of his youngest son, Kaikhosrau, who held the capital after him (till 1199) until his elder brother, Rokn ed-dín Sulaimán, after having vanquished his other brothers, ascended the throne and obliged Kaikhosrau to seek refuge at the Greek emperor's court. This valiant prince saved the empire from destruction and conquered Erzerúm, which had been ruled during a considerable time by a separate dynasty, and was now given in fief to his brother, Mughít ed-din Toghrul Sháh. But, marching thence against the Georgians, Sulaimán's troops suffered a terrible defeat; after this Sulaimán set out to subdue his brother Mas'úd Sháh, at Angora, who was finally taken prisoner and treacherously murdered. This crime is regarded by Oriental authors as the reason of the premature death of the sultan (in 1204); but it is more probable that he was murdered because he displeased the Mohammedan clergy, who accused him of atheism. His son, Kilig Arslán III., was soon deposed by Kaikhosrau (who returned), assisted by the Greek Maurozomes, whose daughter he had married in exile. He ascended the throne the same year in which the Latin empire was established in Constantinople, a circumstance highly favorable to the Turks, who were the natural allies of the Greeks (Theodore Lascaris) and the enemies of the crusaders and their allies, the Armenians. Kaikhosrau, therefore, took in 1207 from the Italian Aldobrandini the important harbor of Attalia (Adalia); but his conquests in this direction were put an end to by his attack upon Lascaris, for in the battle that ensued he perished in single combat with his royal antagonist (1211). His son and successor, Kaikávús, made peace with Lascaris and extended his frontiers to the Black Sea by the conquest of Sinope (1214). On this occasion he was fortunate enough to take prisoner the Comnenian prince (Alexis) who ruled the independent empire of Trebizond, and he compelled him to purchase his liberty by acknowledging the supremacy of the Seljúks, by paying tribute, and by serving in the armies of the sultan. Elated by this great success and by his victories over the Armenians, Kaikávús was induced to attempt the capture of the important city of Aleppo, at this time governed by the descendants of Saladin; but the affair miscarried. Soon afterward the sultan died (1219) and was succeeded by his brother, Alá ed-dín Kaikobád, the most powerful and illustrious prince of this branch of the Seljúks, renowned not only for his successful wars but also for his magnificent structures at Konieh, Alaja, Sivás, and elsewhere, which belong to the best specimens of Saracenic architecture. The town of Alaja was the creation of this sultan, as previously there existed on that site only the fortress of Candelor, at that epoch in the possession of an Armenian chief, who was expelled by Kaikobád, and shared the fate of the Armenian and Frankish knights who possessed the fortresses along the coast of the Mediterranean as far as Selefke (Seleucia). Kaikobád extended his rule as far as this city, and desisted from further conquest only on condition that the Armenian princes would enter into the same kind of relation to the Seljúks as had been imposed on the Commenians of Trebizond. But his greatest military fame was won by a war which, however glorious, was to prove fatal to the Seljúk empire in the future: in conjunction with his ally, the Eyyúbid prince Al-Ashraf, he defeated the Khárizm sháh Jelál ed-dín near Arzengán (1230). This victory removed the only barrier that checked the progress of the Mongols. During this war Kaikobád put an end to the collateral dynasty of the Seljúks of Erzerúm and annexed its possessions. He also gained the city of Khelát with dependencies that in former times had belonged to the Sháh-i-Armen, but shortly before had been taken by Jelál ed-dín; this aggression was the cause of the war just mentioned. The acquisition of Khelát led, however, to a new war, as Kaikobád's ally, the Eyyúbid prince, envied him this conquest. Sixteen Mohammedan princes, mostly Eyyúbids, of Syria and Mesopotamia, under the leadership of Al-Malik al-Kámil, prince of Egypt, marched with considerable forces into Asia Minor against him. Happily for Kaikobád, the princes mistrusted the power of the Egyptian, and it proved a difficult task to penetrate through the mountainous well-fortified accesses to the interior of Asia Minor, so that the advantage rested with Kaikobád, who took Kharput, and for some time even held Harrán, Ar-Roha, and Rakka (1232). The latter conquests were, however, soon lost, and Kaikobád himself died in 1234 of poison administered to him by his son and successor, Ghiyáts ed-dín Kaikhosrau II. This unworthy son inherited from his father an empire embracing almost the whole of Asia Minor, with the exception of the countries governed by Vatatzes (Vataces) and the Christian princes of Trebizond and Lesser Armenia, who, however, were bound to pay tribute and to serve in the armies—an empire celebrated by contemporary reports for its wealth. But the Turkish soldiers were of little use in a regular battle, and the sultan relied mainly on his Christian troops, so much so that an insurrection of dervishes which occurred at this period could only be put down by their assistance. It was at this epoch also that there flourished at Konieh the greatest mystical poet of Islam, and the founder of the order of the Mawlawis, Jelál ed-dín Rúmí (d. 1273; see RÚMÍ), and that the dervish fraternities spread throughout the whole country and became powerful bodies, often discontented with the liberal principles of the sultans, who granted privileges to the Christian merchants and held frequent intercourse with them. Notwithstanding all this, the strength and reputation of the empire were so great that the Mongols hesitated to invade it, although standing at its frontiers. But, as they crossed the border, Kaikhosrau marched against them, and suffered a formidable defeat at Kuzadág (between Arzengán and Sivás) in 1243, which forced him to purchase peace by the promise of a heavy tribute. The independence of the Seljúks was now forever lost, and the Seljukian dynasty came to an end in 1315 with Kaikobád, who was succeded by an Ottoman.

SELKIRK, a lowland county of Scotland, of tortuous outline, is bounded by Midlothian on the north, by Peebles on the north and west, by Dumfries on the south, and by Roxburgh on the east. Its extreme length from southwest to northeast is 28 miles, its greatest breadth from east to west 17, and its total area 260 square miles or 166,524 acres, of which 1,997 are water.

Manufactures.—So early as the beginning of the seventeenth century the village of Galashiels did a considerable local trade in woolen cloth, then or shortly afterward known as "Galashiels gray," and toward the end of the eighteenth century this industry was greatly stimulated by judicious grants from "the equivalent" paid by England at the Union. About the end of the first quarter of the nineteenth century a few novelties in pattern (mostly accidental) led to the opening up of what has now become a vast industry—the tweed trade, which still has its acknowledged center in Selkirk.

Administration and Population.—Selkirkshire with Peeblesshire forms one parliamentary constituency. Of entire civil parishes it contains only two, with parts of nine others; there are also, taken from these, three *quoad sacra* parishes and part of a fourth. The population, 4,937 in 1755 and 9.809 in 1851, was in 1881 returned at 25,564—an increase partly due to the annexation of a portion of Galashiels formerly reckoned in Roxburgh. Outside the two towns of Galashiels (population 9,140 in 1881) and Selkirk, population has been almost stationary for more than a century, that of the landward parishes in 1755 and 1881 being respectively as follows: Ashkirk, 200 and 138; Innerleithen, 60 and 61; Ettrick, 397 and 397; Stow, 260 and 441; Yarrow, 1,180 and 611; Roberton, 250 and 250.

SELKIRK, the county town of Selkirkshire, is on the river Ettrick, between its absorption of the Yarrow and its junction with the Tweed, and is connected by a branch railway with the Waverley line from Scotland to England. Although almost entirely a manufacturing town, having several large mills for woolen cloth and yarn, it is not without importance as the center of an extensive pastoral area. The county offices and prison excepted, the public buildings of Selkirk are not striking. The population of the burgh was 1,053 in 1735, 1,800 in 1831, and 6,090 in 1881.

SELKIRK, or SELCRAIG, ALEXANDER, a sailor who is supposed to have been the prototype of Defoe's "Robinson Crusoe," was the son of a shoemaker and tanner of Largo, Fifeshire, Scotland, and was born in 1676. In his youth he displayed a quarrelsome and unruly disposition, and, having been summoned, on August 27, 1695, before the kirk-session for his indecent behavior in church, "did not compear, being gone away to the seas." At an early period he was engaged in buccaneer expeditions to the South Seas, and in 1703 joined the "Cinque Ports" galley as sailing master. The following year he had a dispute with the captain, and at his own request was, in October, put ashore on the island of Juan Fernandez, where, after a solitary residence of four years and four months, he was taken off by Capt. Woods Rogers, commander of a privateer, who made him his mate and afterward gave him the independent command of one of his prizes. He returned home in 1712; but, in 1717, he eloped with a country girl and again went to sea. He died in 1723, while lieutenant on board the royal ship *Weymouth.*

SELMA, the county seat of Dallas county, Ala., occupies a prominent bluff on the Alabama river nearly 165 miles north of Mobile, with which city it has communication by both rail and water. The city is handsomely laid out, well built, and a prominent shipping point for the rich cotton-growing district of the surrounding country. It is also an important railroad center, being at the intersection of the East Tennessee, Virginia and Georgia; the Cincinnati, Selma and Mobile; the New Orleans and Selma; the Louisville and Nashville, and the Western Alabama roads; the business of each also being annually increased by shipments from Selma to points north and south. During the period which has elapsed since the close of the war the municipal limits of the city have been extended in response to the demands for more room, made by the steadily increasing population, for residence and manufacturing purposes, until it is now an important seat of trade. It contains a court house, city hall, two national banks, two daily and three weekly papers, two academies, several hotels, an opera house and public halls, sixteen churches, and many well-equipped and well-stocked stores. The list of manufactures includes cotton-seed oil, cotton batting and goods, ice, hollow-ware, car wheels, sash, doors, and blinds, etc., etc. The population at the United States census of 1890 was returned at 7,626.

SEMIPALATINSK, an extensive province (*oblast*) of the Russian dominions in Central Asia; administratively forms a part of the general-governorship of the steppes, although its northern portions really belong to the Irtish plains of West Siberia. It has an area of 188,300 square miles, and is bounded on the north by Tobolsk and Tomsk, on the southeast by China, on the south by Semiryetchensk, and on the west by Akmolinsk.

The chief inhabitants are Kirghiz-kazaks, who acknowledged the supremacy of Russia in 1732, and may number now (1890) over half a million (479,750 in 1876, of whom 10,950 were settled in towns). The Russian population, which in the same year amounted to nearly 50,000 Cossacks and peasants, has slowly increased since. The aggregate population was in 1882 estimated at 538,400, of whom 34,550 lived in towns. The Russians are chiefly agriculturists, and have wealthy settlements on the right bank of the Irtish, as well as a few patches in the south, at the foot of the mountains. The Kirghizes are almost exclusively cattle-breeders and keep large flocks of sheep, horses, and horned cattle, as also camels. Hunting and fishing (in Lake Zaisan) are favorite and profitable occupations with the Cossacks and the Kirghizes. Industries are of course insignificant, except that of mining—gold being obtained within the province to the amount of from 300 to 400 pounds every year; the extraction of silver and lead is very limited. Trade is of some importance, and is increasing—Russian manufactured articles being exchanged for the raw produce (hides, tallow, cattle) of the region. The province is divided into four districts, the chief towns of which are Semipalatinsk (17,820 inhabitants in 1881), Pavlodar (2,260), Kokbekty (3,680), and Karkaralinsk (2,030). All these towns, lost amidst the sandy steppes, are mere administrative centers. Bukhtarma and Ust-Kamenogorsk (3,400), among the mountains, are also worthy of mention.

SEMIPALATINSK, capital of the above province, is situated on the right bank of the Irtish, on the highway from Central Asia to northern Europe. The inhabitants (17,820 in 1881) consist of officials, merchants, and agriculturists.

SEMIRAMIS. According to the legend which the Greeks received from Ctesias, and which is most fully preserved by Diodorus (book ii.) in a form that, according to the researches of C. Jacoby (*Rhein Museum*, 1875, p. 555 *seq.*), is not taken direct from Ctesias but comes through Clitarchus, and has been modified by traits borrowed from the history of Alexander the Great, the Assyrian empire over all Asia as far as the borders of India was created by Ninus, the founder of Nineveh, and his greater spouse Semiramis, who was first the wife of his captain, Onnes, but won the king's love by an heroic exploit, the capture of Bactra, which had defied the royal forces. Ninus died, and Semiramis, succeeding to his power, traversed all parts of the empire, erecting great cities (especially Babylon) and stupendous monuments or opening roads through savage mountains. She was unsuccessful only in an attack on India. At length, after a reign of forty-two years, she delivered up the kingdom to her son Ninyas and disappeared, or, according to what seems to be the original form of the story, was turned into a dove and was thenceforth worshiped as a deity.

SEMIRYETCHENSK, a province of Russian Turkestan, including the steppes south of Lake Balkash and parts of the Tian-Shan mountains around Lake Issik-kul. It has an area of 155,300 square miles and is bounded by Semipalatinsk on the north, by China (Jugutchak, Kuldja, Aksu, and Kashgaria) on the east and south, and by the Russian provinces of Ferganah, Syr-Daria, and Akmolinsk on the west.

The population, which was estimated at 748,800 by M. Kostenko in 1880 (139,660 being in the Kuldja region), has since increased, the latest official figures (1882) giving 685,950 for the province, exclusive of the Kuldja region. Of these Russians numbered, according to Kostenko, 44,585, 20,640 were Cossacks, who are very poor as compared with the free Russian emigrants. The majority of the population are Kirghiz, (595,237); next come Tarantchis (36,265), Kalmucks (about 25,000), Mongols and Manchurians (22,000), and Dungans (19,657), these last two mostly in Kuldja; while Tartars and Sarts are each represented by some 3,000 or 3,500 (all the foregoing figures include those for Kuldja). The province is subdivided into five districts; Vyernyi (18,423 inhabitants in 1879, of whom 3,586 were military), the chief town of the province, formerly Almaty, is situated at the foot of the Trans-Ilian Ala-tau, and has a mixed population of Russians, Tartars, Sarts, Kirghiz, Kalmucks, and Jews; its trade with Kuldja and Kashgar is increasing rapidly, and it has now two lyceums, for boys and girls, and several other schools. The other towns—Kopal (5,450 inhabitants), Serghiopol (1,045), Tokmak (1,770), and Karakol (2,780)—are merely administrative centers.

SEMITIC LANGUAGES. The name "Semitic languages" is used to designate a group of Asiatic and African languages, some living and some dead, namely, Hebrew and Phœnician, Aramaic, Assyrian, Arabic, Ethiopic (Geez and Amharic). The name, which was introduced by Eichhorn, is derived from the fact that most nations which speak or spoke these languages are descended, according to Genesis, from Shem, son of Noah. The connection of the Semitic languages with one another is somewhat close, in any case closer than that of the Indo-European languages. When the various cognate languages of a group diverge in essential points, it is by no means always possible to determine which of them has retained the more primitive form. The history of the development of these tongues during the period anterior to the documents which we possess is often extremely obscure in its details.

The question which of the known Semitic dialects most resembles the primitive Semitic language is less important than one might at first suppose, since the question is one not of absolute but only of relative priority.

A comparative grammar of the Semitic languages must of course be based upon Arabic, but must in every matter of detail take into consideration all the cognate languages, as far as they are known to us. In the reconstruction of the primitive Semitic tongue Hebrew might perhaps afford more assistance than Ethiopic; but Aramaic, Assyrian, and even the less known and the more modern dialects might furnish valuable materials.

Many attempts have been made, sometimes in a very superficial fashion, and sometimes by the use of scientific methods, to establish a relationship between the Semitic languages and the Indo-European. It was very natural to suppose that the tongues of the two races which, with the single exceptions of the Egyptians and the Chinese, have formed and molded human civilization, who have been near neighbors from the earliest times, and who, moreover, seem to bear a great physical resemblance to one another, can be nothing else than two descendants of the same parent speech. But all these endeavors have wholly failed.

On the other hand, the Semitic languages bear so striking a resemblance in some respects to certain languages of northern Africa, that we are forced to assume the existence of a tolerably close relationship between the two groups. We allude to the family of languages known in modern times as the "Hamitic," and composed of the Egyptian, Berber, Beja (Bishárí, etc.), and a number of tongues spoken in Abyssinia and the neighboring countries (Agaw, Galla, Dankali, etc.) It must be admitted that there is also much disagreement—for instance, the widest divergence in the mass of the vocabulary; and this applies to the Semitic languages as compared not only with those Hamitic languages that are gradually becoming known to us at the present day, but with the Egyptian, of which we possess documents dating from the fourth millennium before the Christian era. The question is here involved in great difficulties.

The connection between the Semitic languages and the Hamitic appears to indicate that the primitive seat of the Semites is to be sought in Africa; for it can scarcely be supposed that the Hamites, among whom there are gradual transitions from an almost purely European type to that of the Negroes, are the children of any other land than "the dark continent." There seems, moreover, to be a considerable physical resemblance between the Hamites and the Semites, especially in the case of the southern Arabs; we need mention only the slight development of the calf of the leg, and the sporadic appearance among Semites of woolly hair and prominent jaws. But both Semites and Hamites have been mingled to a large extent with foreign races, which process must have diminished their mutual similarity. All this, however, is offered not as a definite theory but as a modest hypothesis.

Scarcely any man of science now believes in the northern origin of the Semites.

Others, as Sprenger and Schrader, consider the birthplace of the Semitic race to have been in Arabia.

Finally, one of the most eminent of contemporary Orientalists, Ignazio Guidi, has attempted to prove that the home of the Semites is on the lower Euphrates.

We must therefore for the present confess our inability to make any positive statement with regard to the primitive seat of the original Semitic race.

It is not very easy to settle what is the precise connection between the various Semitic languages, considered individually. In this matter one may easily be led to hasty conclusions by isolated peculiarities in vocabulary or grammar. Each of the older Semitic languages occasionally agrees in grammatical points with some other to which in most respects it bears no very close resemblance, while dialects much more nearly related to it are found to exhibit different formations. Each Semitic tongue also possesses features peculiar to itself.

One thing at least is certain, that Arabic (with Sabæan) and Ethiopic stand in a comparatively close relationship to one another, and compose a group by themselves, as contrasted with the other Semitic languages, Hebræo-Phœnician Aramaic, and Assyrian, which constitute the northern group. Only in these southern dialects do we find, and that under forms substantially identical, the important innovation known as the "broken plurals."

Although we cannot deny that there may formerly have existed Semitic languages quite distinct from those with which we are acquainted, yet that such was actually the case cannot be proved. Nor is there any reason to think that the domain of the Semitic languages ever extended very far beyond its present limits. Some time ago many scholars believed that they were once spoken in Asia Minor and even in Europe, but, except in the Phœnician colonies, this notion rested upon no solid proof. It cannot be argued with any great degree of plausibility that even the Cilicians, who from a very early period held constant intercourse with the Syrians and the Phœnicians, spoke a Semitic language.

Hebrew.— Hebrew and Phœnician are but dialects of one and the same language. It is only as the language of the people of Israel that Hebrew can be known with any precision.

The Mesha inscription is the only non-Israelite source from which any knowledge of ancient Hebrew can be obtained. Some fragments in the Old Testament belong to the second millennium before our era—particularly the song of Deborah (Judges v.), a document which, in spite of its many obscurities in matters of detail, throws much light on the condition of the Israelites at the time when the Canaanites were still contending with them for the possession of the country. The first rise of an historical literature may very probably date from before the establishment of the monarchy.

The destruction of the Judæan kingdom dealt a heavy blow to the Hebrew language. But it is going too far to suppose that it was altogether banished from ordinary life at the time of the exile, and that Aramaic came into use among all the Jews. In the East even small communities, especially if they form a religious body, often cling persistently to their mother-tongue, though they may be surrounded by a population of alien speech; and such was probably the case with the Jews in Babylonia. Even so late as the time of Ezra, Hebrew was in all probability the ordinary language of the new community.

After the time of Alexander large bodies of the Jewish population were settled in Alexandria and other western cities, and were very rapidly Hellenized. Meanwhile the principal language of Syria and the neighboring countries, Aramaic, the influence of which may be perceived even in some preëxilic writings, began to spread more and more among the Jews. Hebrew gradually ceased to be the language of the people and became that of religion and the schools. The book of Daniel, written in 167 or 166 B.C., begins in Hebrew, then suddenly passes into Aramaic, and ends again in Hebrew.

But in the last period of the history of Jerusalem, and still more after the destruction of the city by Titus, the Jewish schools played so important a part that the life of the Hebrew language was in a manner prolonged The lectures and discussions of the learned were carried on in that tongue. We have very extensive specimens of this more modern Hebrew in the Mishnah and other works, and scattered pieces throughout both Talmuds. But, just as the "classical" Sanskrit, which has been spoken and written by the Brahmans during the last twenty-five centuries, differs considerably from the language which was once in use among the people, so this "language of the learned" diverges in many respects from the "holy language;" and this distinction is one of which the rabbis were perfectly conscious.

The ancient Hebrew language, especially in the matter of syntax, has an essentially primitive character. Parataxis of sentences prevails over hypotaxis to a greater extent than in any other literary Semitic language with which we are well acquainted. The favorite method is to link sentences together by means of a simple "and." There is a great lack of particles to express with clearness the more subtle connection of ideas. The use of the verbal tenses is in a great measure determined by the imagination, which regards things unaccomplished as accomplished and the past as still present. There are but few words or inflexions to indicate slight modifications of meaning, though in ancient times the language may perhaps have distinguished certain moods of the verb somewhat more plainly than the present punctuation does.

The vocabulary of the Hebrew language is, as we have said, known but imperfectly. The Old Testament is no very large work; it contains, moreover, many repetitions, and a great number of pieces which are of little use to the lexicographer. On the other hand, much may be derived from certain poetical books, such as Job.

Phœnician.—This dialect closely resembles Hebrew, and is known to us from only one authentic source, namely, inscriptions, some of which date from about 600 B.C. or earlier; but the great mass of them begin with the fourth century before our era. These inscriptions we owe to the Phœnicians of the mother-country and the neighboring regions (Cyprus, Egypt, and Greece), as well as to the Phœnicians of Africa, especially Carthage. Inscriptions are, however, a very insufficient means for obtaining the knowledge of a language. The number of subjects treated in them is not large; many of the most important grammatical forms and many of the words most used in ordinary life do not occur. Moreover, the "lapidary style" is often very hard to understand. The repetition of obscure phrases, in the same connection, in several inscriptions does not help to make them more intelligible. The vocabulary of the language is very like that of Hebrew, but words rare in Hebrew are often common in Phœnician. Traces of dialectical distinctions have been found in the great inscription of Byblus, the inhabitants of which seem to be distinguished from the rest of the Phœnicians in Josh. xiii. 5 (and 1 Kings v. 32? [A. V. v. 18]). It is probable that various differences between the language of the mother-country and that of the African colonies arose at an early date, but our materials do not enable us to come to any definite conclusion on this point.

Aramaic.—Aramaic is nearly related to Hebræo-Phœnician; but there is nevertheless a sharp line of demarcation between the two groups. Of its original home nothing certain is known.

The oldest extant Aramaic documents consist of inscriptions on monuments and on seals and gems. In the Persian period Aramaic was the official language of the provinces west of the Euphrates; and this explains the fact that coins which were struck by governors and vassal princes in Asia Minor, and of which the stamp was in some cases the work of skilled Greek artists, bear Aramaic inscriptions, while those of other coins are Greek. This, of course, does not prove that Aramaic was ever spoken in Asia Minor and as far north as Sinope and the Hellespont. In Egypt Aramaic inscriptions have been found of the Persian period, one bearing the date of the fourth year of Xerxes (482 B.C.); we have also official documents on papyrus, unfortunately in a very tattered condition for the most part, which prove that the Persians preferred using this convenient language to mastering the difficulties of the Egyptian systems of writing.

The Aramaic portions of the Old Testament show us the form of the language which was in use among the Jews of Palestine. Isolated passages in Ezra perhaps belong to the Persian period, but have certainly been remodeled by a later writer. Yet in Ezra we find a few antique forms which do not occur in Daniel. The Aramaic pieces contained in the Bible have the great advantage of being furnished with vowels and other orthographical signs, though these were not inserted until long after the composition of the books, and are sometimes at variance with the text itself. But, since Aramaic was still a living language when the punctuation came into existence, and since the lapse of time was not so very great, the tradition ran less risk of corruption than in the case of Hebrew. Biblical Aramaic, as also the language of the Palmyrene and Nabatæan inscriptions, may be described as an older form of Western Aramaic. The opinion that the Palestinian Jews brought their Aramaic dialect direct from Babylon—whence the incorrect name "Chaldee"—is altogether untenable.

We may now trace somewhat further the development of Western Aramaic in Palestine; but unhappily few of the sources from which we derive our information can be thoroughly trusted. In the synagogues it was necessary that the reading of the Bible should be followed by an oral "Targum" or translation into Aramaic, the language of the people. The Targum was at a later period fixed in writing, but the officially sanctioned form of the Targum to the Pentateuch (the so-called Targum of Onkelos) and of that to the prophets (the so-called Jonathan) was not finally settled till the fourth or fifth century, and not in Palestine but in Babylonia. The redactors of the Targum preserved on the whole the older Palestinian dialect; yet that of Babylon, which differed considerably from the former, exercised a vitiating influence. The punctuation, which was added later, first in Babylonia, is far less trustworthy than that of the Aramaic pieces in the Bible. The language of Onkelos and Jonathan differs but little from Biblical Aramaic. The language spoken sometime afterward by the Palestinian Jews, especially in Galilee, is exhibited in a series of rabbinical works, the so-called Jerusalem Targums (of which, however, those on the Hagiographa are in some cases of later date), a few Midrashic works, and the Jerusalem Talmud.

Not only the Jews but also the Christians of Palestine retained their native dialect for some time as an ecclesiastical and literary language. We possess translations of the Gospels and fragments of other works in this dialect by the Palestinian Christians dating from about the fifth century, accompanied by a punctuation which was not added till some time later. This dialect closely resembles that of the Palestinian Jews, as was to be expected from the fact that those who spoke it were of Jewish origin.

Finally, the Samaritans, among the inhabitants of Palestine, translated their only sacred book, the Pentateuch, into their own dialect. The critical study of this translation proves that the language which lies at its base was very much the same as that of the neighboring Jews.

As early as the seventh century the conquests of the Moslems greatly circumscribed the domain of Aramaic and a few centuries later it was almost completely supplanted in the west by Arabic.

The popular Aramaic dialect of Babylonia from the fourth to the sixth century of our era is exhibited in the Babylonian Talmud, in which, however, as in the Jerusalem Talmud, there is a constant mingling of Aramaic and Hebrew passages. To a somewhat later period, and probably not to exactly the same district of Babylonia, belong the writings of the MANDÆANS (*q.v.*), a strange sect, half Christian and half heathen, who, from a linguistic point of view, possess the peculiar advantage of having remained almost entirely free from the influence of Hebrew, which is so perceptible in the Aramaic writings of Jews as well as of Christians. The orthography of the Mandæans comes nearer than that of the Talmud to the real pronunciation, and in it the softening of the gutturals is most clearly seen. In other respects there is a close resemblance between Mandæan and the language of the Babylonian Talmud.

At Edessa, in the west of Mesopotamia, the native dialect had already been used for some time as a literary language, and had been reduced to rule through the influence of the schools (as is proved by the fixity of the grammar and orthography) even before Christianity acquired power in the country in the second century. At an early period the Old and New Testaments were here translated, with the help of Jewish tradition. This version (the so-called Peshítta or Peshito) became the Bible of Aramæan Christendom, and Edessa became its capital. Thus the Aramæan Christians of the neighboring countries, even those who were subjects of the Persian empire, adopted the Edessan dialect as the language of the church, of literature, and of cultivated intercourse.

Arabic everywhere put a speedy end to the predominance of Aramaic—a predominance which had lasted for more than a thousand years—and soon began to drive Syriac out of use. When Syriac became extinct in Edessa and its neighborhood is not known with certainty. This language, called Syriac *par excellence*, is not the immediate source whence are derived the Aramaic dialects still surviving in the northern districts. In the mountains known as the Túr 'Abdín in Mesopotamia, in certain districts east and north of Mosul, in the neighboring mountains of Kurdistan, and again beyond them on the western coast of Lake Urmia, Aramaic dialects are spoken by Christians and occasionally by Jews, and some of these dialects we know with tolerable precision. The dialect of Túr 'Abdín seems to differ considerably from all the rest; the country beyond the Tigris is, however, divided, as regards language, among a multitude of local dialects. Among these, that of Urmia has become the most important, since American missionaries have formed a new literary language out of it. Moreover, the Roman Propaganda has printed books in two of the Neo-Syriac dialects. All these dialects exhibit a complete transformation of the ancient type, to a degree incomparably greater than is the case with Mandæan.

Aramaic is frequently described as a *poor* language. This is an opinion which we are unable to share. It is quite possible, even now, to extract a very large vocabulary from the more ancient Aramaic writings, and yet in this predominantly theological literature a part only of the words that existed in the language have been preserved. It is true that Aramaic, having from the earliest times come into close contact with foreign languages, has borrowed many words from them, in particular from Persian and Greek; but, if we leave out of consideration the fact that many Syrian authors were in the habit of using as ornaments or for convenience (especially in translations), a great number of Greek words, some of which were unintelligible to their readers, we shall find that the proportion of really foreign words in older Aramaic books is not larger, perhaps even smaller, than the proportion of Romance words in German or Dutch.

Assyrian.—Long before Aramaic another Semitic language flourished in the regions of the Tigris and on the lower Euphrates which has been preserved to us in the cuneiform inscriptions. It is usually called the Assyrian, after the name of the country where the first and most important excavations were made; but the term "Babylonian" would be more correct, as Babylon was the birthplace of this language and of the civilization to which it belonged. Certain Babylonian inscriptions appear to go back to the fourth millennium before our era; but the great mass of these cuneiform inscriptions date from between 1,000 and 500 B.C. Assyrian seems to be more nearly related to Hebrew than to Aramaic.

The native cuneiform writing was used in Babylonia not only under the Persian empire but also in the Greek period, as the discovery of isolated specimens proves. It does not of course necessarily follow from this that Assyrian was still spoken at that time. Indeed, this language may possibly have been banished from ordinary life long before the destruction of Nineveh, surviving only as the official and sacerdotal tongue. These inscriptions, in any case, were intended for none but a narrow circle of learned persons.

Arabic.—The southern group of Semitic languages consists of Arabic and Ethiopic. Arabic, again, is subdivided into the dialects of the larger portion of Arabia and those of the extreme south, (the Sabæan, etc.) At a very much earlier time than we were but lately justified in supposing, some of the northern Arabs reduced their language to writing.

The numerous inscriptions scattered over the northwest of Arabia, especially over the wild and rocky district of Safá, near Damascus, probably date from a later period. They are written in peculiar characters, which, it would seem, are likewise related to those used by the Sabæans. They are all of them short and indistinct, scratched hurriedly and irregularly upon unhewn stone. What we at present understand of them—they consist almost entirely of proper names—is owing in nearly every case to the ingenuity of Halévy. In matters of detail, however, much still remains uncertain.

The Arabs who inhabited the Nabatæan kingdom wrote in Aramaic, but, as has been remarked above, their native language, Arabic, often shows through the foreign disguise. We are thus able to satisfy ourselves that these Arabs, who lived a little before and a little after Christ, spoke a dialect closely resembling the later classical Arabic.

During the whole period of the preponderance of Aramaic, this language exercised a great influence upon the vocabulary of the Arabs. The more carefully we investigate the more clearly does it appear that numerous Arabic words, used for ideas or objects which presuppose a certain degree of civilization, are borrowed from the Aramæans.

In the sixth century the inhabitants of the greater part of Arabia proper spoke everywhere essentially the same language, which, as being by far the most important of all Arabic dialects, is known simply as the Arabic language. Arabic poetry, at that time cultivated throughout the whole of central and northern Arabia as far as the lower Euphrates and even beyond it, employed one language only. The extant Arabic poems belonging to the heathen period were not indeed written down till much later, and meanwhile underwent considerable alterations; but the absolute regularity of the meter and rhyme is a sufficient proof that on the whole these poems all obeyed the same laws of language. It is indeed highly probable that the rhapsodists and the grammarians have effaced many slight dialectical peculiarities; in a great number of passages, for example, the poets may have used, in accordance with the fashion of their respective tribes, some other case than that prescribed by the grammarians, and a thing of this kind may afterward have been altered, unless it happened to occur in rhyme; but such alterations cannot have extended very far.

The Koran and Islam raised Arabic to the position of one of the principal languages of the world. Under the leadership of the Koraish the Bedouins subjected half the world to both their dominion and their faith. Thus Arabic acquired the additional character of a sacred language. But soon it became evident that not nearly all the Arabs spoke a language precisely identical with the classical Arabic of the poets. The northwestern Arabs played a particularly important part during the period of the Omayyads. The ordinary speech of Mecca and Medina was, as we have seen, no longer quite so primitive as that of the desert. To this may be added that the military expeditions brought those Arabs who spoke the classical language into contact with tribes from out-of-the-way districts, such as 'Omán, Bahrain (Bahrein), and particularly the north of Yemen. The fact that numbers of foreigners, on passing over to Islam, became rapidly Arabized, was also little calculated to preserve the unity of the language. Finally, the violent internal and external commotions which were produced by the great events of that time, and stirred the whole nation, probably accelerated linguistic change. In any case, we know from good tradition that even in the first century of the Flight the distinction between correct and incorrect speech was quite perceptible. About the end of the second century the system of Arabic grammar was constructed, and never underwent any essential modification in later times.

Through the industry of Arabic philologists we are able to make ourselves intimately acquainted with the system, and still more with the vocabulary of the language, although they have not always performed their task in a critical manner. We should be all the more disposed to admire the richness of the ancient Arabic vocabulary when we remember how simple are the conditions of life among the Arabs, how painfully monotonous their country, and consequently how limited the range of their ideas must be. Within this range, however, the slightest modification is expressed by a particular word. It must be confessed that the Arabic lexicon has been greatly augmented by the habit of citing as words by themselves such rhetorical phrases as an individual poet has used to describe an object; for example, if one poet calls the lion the "tearer" and another calls him the "mangler," each of these terms is explained by the lexicographers as equivalent to "lion." One branch of literature in particular, namely, lampoons and satirical poems, which for the most part have perished, no doubt introduced into the lexicon many expressions coined in an arbitrary and sometimes in a very strange manner. Moreover, Arabic philologists have greatly underrated the number of words which, though they occur now and then in poems, were never in general use except among particular tribes. But in spite of these qualifications it must be admitted that the vocabulary is surprisingly rich, and the Arabic dictionary will always remain the principal resource for the elucidation of obscure expressions in all the other Semitic tongues. This method, if pursued with the necessary caution, is a perfectly legitimate one.

Classical Arabic is rich not only in words but in grammatical forms. The wonderful development of the broken plurals, and sometimes of the verbal nouns, must be regarded as an excess of wealth. The sparing use of the ancient terminations which mark the plural has somewhat obscured the distinction between plurals, collectives, abstract nouns, and feminines in general. In its manner of employing the verbal tenses genuine Arabic still exhibits traces of that poetical freedom which we see in Hebrew; this characteristic disappears in the later literary language. In connecting sentences Arabic can go much further than Hebrew, but the simple parataxis is by far the most usual construction.

It is entirely a mistake to suppose that Arabic is unsuited for the treatment of abstract subjects. On the contrary, scarcely any language is so well adapted to be the organ of scholasticism in all its branches. Even the tongue of the ancient Bedouins had a strong preference for the use of abstract verbal nouns (in striking contrast to the Latin, for example); thus they oftener said "Needful is thy sitting" than "It is needful that thou shouldest sit." This tendency was very advantageous to philosophical phraseology. The strict rules as to the order of words, though very unfavorable to the development of a truly eloquent style, render it all the easier to express ideas in a rigidly scientific form.

Sabæan.—Long before Mohammed, a peculiar and highly developed form of civilization had flourished in the tableland to the southwest of Arabia. The more we become acquainted with the country of the ancient Sabæans and with its colossal edifices, and the better we are able to decipher its inscriptions, which are being discovered in ever-increasing numbers, the easier it is for us to account for the haze of mythical glory wherewith the Sabæans were once invested. The Sabæan inscriptions (which till lately were more often called by the less correct name of "Himyaritic") begin long before our era and continue till about the fourth century. The somewhat stiff character is always very distinct; and the habit of regularly dividing the words from one another renders decipherment easier, which, however, has not yet been performed in a very satisfactory manner, owing in part to the fact that the vast majority of the documents in question consist of religious votive tablets with peculiar sacerdotal expressions, or of architectural notices abounding in technical terms. These inscriptions fall into two classes, distinguished partly by grammatical peculiarities and partly by peculiarities of phraseology. One dialect, which forms the causative with *ha*, like Hebrew and others, and employs, like nearly all the Semitic languages, the termination *h* (*hú*) as the suffix of the third person singular, is the Sabæan properly speaking. The other, which expresses the causative by *sa* (corresponding to the Shaphel of the Aramæans and others), and for the suffix uses *s* (like the Assyrian *sh*), is the Minaic.

As the Sabæan writing seldom indicates the vowels, our knowledge of the language is necessarily very incomplete; and the unvarying style of the inscriptions excludes a great number of the commonest grammatical forms.

Soon after the Christian era Sabæan civilization began to decline, and completely perished in the wars with the Abyssinians, who several times occupied the country, and in the sixth century remained in possession of it for a considerable period. In that age the language of central Arabia was already penetrating into the Sabæan domain. It is further possible that many tribes which dwelt not far to the north of the civilized districts had always spoken dialects resembling central Arabic rather than Sabæan. About the year 600 "Arabic" was the language of all Yemen, with the exception perhaps of a few isolated districts, and this process of assimilation continued in later times. Several centuries after Mohammed learned Yemenites were acquainted with the characters of the inscriptions which abounded in their country; they were also able to decipher the proper names and a small number of Sabæan words the meaning of which was still known to them, but they could no longer understand the inscriptions as a whole. Being zealous local patriots, they discovered in those inscriptions which they imagined themselves to be capable of deciphering many fabulous stories respecting the glory of the ancient Yemenites.

Ethiopic.—In Abyssinia, too, and in the neighboring countries we find languages which bear a certain resemblance to Arabic. The Geez or Ethiopic proper, the language of the ancient kingdom of Aksúm, was reduced to writing at an early date. To judge by the few passages communicated by Salt, the back of the inscription of Aeizanas, king of Aksúm about 350, exhibits writing in the Sabæan language, which appears to prove that the development of the Geez character out of the Sabæan, and the elevation of Geez to the rank of a literary language, must have taken place after the year 350. The oldest monuments of this language which are known with certainty are the two great inscriptions of Tázéná, a heathen king of Aksúm, dating from about 500.

Geez is more nearly related to Sabæan than to Arabic, though scarcely to such a degree as we might expect. The historical intercourse between the Sabæans and the people of Aksúm does not, however, prove that those who spoke Geez were simply a colony from Sabæa; the language may be descended from an extinct cognate dialect of South Arabia, or may have arisen from a mingling of several such dialects. And this colonization in Africa probably began much sooner than is usually supposed. In certain respects Geez represents a more modern stage of development than Arabic.

Very different is the case with Amharic, a language of which the domain extends from the left bank of the Takkazé into regions far to the south. Although by no means the only language spoken in these countries, it always tends to displace those foreign tongues which surround it and with which it is interspersed. We here refer especially to the Agaw dialects. Although Amharic has been driven back by the invasions of the Galla tribes, it has already compensated itself to some extent for this loss, as the Yedju and Wollo Gallas, who penetrated into eastern Abyssinia, have adopted it as their language. With the exception, of course, of Arabic, no Semitic tongue is spoken by so large a number of human beings as Amharic. The very fact that the Agaw languages are being gradually, and, as it were, before our own eyes, absorbed by Amharic, makes it appear probable that this language must be spoken chiefly by people who are not of Semitic race. This supposition is confirmed by a study of the language itself. Amharic has diverged from the ancient Semitic type to a far greater extent than any of the dialects which we have hitherto enumerated. Many of the old formations preserved in Geez are completely modified in Amharic. Of the feminine forms there remain but few traces; and that is the case also with the ancient plural of the noun. The strangest innovations occur in the personal pronouns. And certainly not more than half the vocabulary can without improbability be made to correspond with that of the other Semitic languages.

In spite of its dominant position, Amharac did not for several centuries show any signs of becoming a literary language. The oldest documents which we possess are a few songs of the fifteenth and sixteenth centuries, which were not, however, written down till a later time, and are very difficult to interpret. There are also a few Geez-Amharic glossaries, which may be tolerably old. Since the seventeenth century various attempts have been made, sometimes by European missionaries, to write in Amharic, and in modern times this language has to a considerable extent been employed for literary purposes.

The Abyssinian chronicles have for centuries been written in Geez, largely intermingled with Amharic elements. This "language of the chronicles," in itself a dreary chaos, often enables us to discover what were the older forms of Amharic words. A similar mixture of Geez and Amharic is exemplified in various other books, especially such as refer to the affairs of the government and of the court.

SEMLER, Johann Salomo, ecclesiastical historian and critic, sometimes called "the father of German rationalism," was born at Saalfeld in Thuringia on December 18, 1725. As a boy he showed the omnivorous appetite for books which was characteristic of his later life. In his seventeenth year he entered the university of Halle, where he became the disciple, afterward the assistant, and at last the literary executor of the orthodox rationalistic Prof. Baumgarten. In 1749 he accepted the position of editor, with the title of professor, of the Coburg official *Gazette*, with leisure to pursue historical and scientific studies. But the next year he was invited to Altdorf as professor of philology and history, and six months later became a professor of theology in Halle. He died at Halle on March 14, 1791, worn out by his prodigious labors, embittered by his desertion, and disappointed at the issue of his work.

SEMLIN (Hung. *Zimony;* Servian, *Semun*), a town of Austria-Hungary, the easternmost in the Military Frontier district, stands on the south bank of the Danube, on a tongue of land between that river and the Save. It is the see of a Greek archbishop, has a real school of lower grade, five Roman Catholic and two Greek churches, a synagogue, a theater, and a customhouse. The population (10,046) consists mostly of Servians, with a few Germans, Greeks, Illyrians, Croats, Gipsies, and Jews.

SEMPER, Gottfried, German architect and writer on art, was born at Altona on November 29, 1803. In 1834 he was appointed professor of architecture in Dresden, and during fifteen years received many important commissions from the Saxon court. In 1848 his turbulent spirit led him to side with the revolution against his royal patron; he furnished the rebels with military plans, and was eventually driven into exile. In 1870 he was called to Vienna to assist in the great architectural projects since carried out round the Ring. A year later, after an exile of over twenty years, he received a summons to Dresden, on the rebuilding of the first opera-house, which had been destroyed by fire in 1869; his second design was a modification of the first. The closing years of his life were passed in comparative tranquillity between Venice and Rome, and in the latter city he died on May 15, 1879.

SENAAR (Sennaar, properly Sennár), a country of east Central Africa, commonly identified with the "Island of Meroe" of the ancients, and included in the central division of Egyptian (Eastern) Súdán, as reorganized in the year 1882. By European writers the term is often applied to the whole region lying between the Atbára (Takazze) and the White Nile, but by native usage is restricted to the district confined between the latter river and the Bahr-el-Azrak (Blue Nile) and its eastern tributaries, the Rahad and the Dender. It is bordered north and northeast by Upper Nubia, east by Abyssinia, west by the White Nile (Bahr-el-Abiad), separating it from Kordofán, and stretches from the confluence of the two Niles at Khartúm southward, in the direction of the Berta highlands in the east and the Búrún and Dinka plains in the west. As thus defined, Sennár extends across five degrees of latitude (16° to 11° N.), with a total length of about 350 miles, a mean breadth of 120 miles, an area of 40,000 square miles, and an approximate population of 300,000.

SÉNANCOUR, Étienne Pivert de, French man-of-letters, was born at Paris in November, 1770. He died at St. Cloud in 1846.

SENEBIER, Jean, a Swiss pastor and voluminous writer on vegetable physiology, was born at Geneva on May 6, 1742, and died in 1809.

SENECA, Lucius Annæus, born about 3 B.C., the most brilliant figure of his time, was the second son of the rhetorician Marcus Annæus Seneca, and, like him, a native of Corduba in Hispania. From his infancy of a delicate constitution, he devoted himself with intense ardor to rhetorical and philosophical studies and early won a reputation at the bar. Caligula threatened his life, and under Claudius his political career received a sudden check, for the influence of Messalina having effected the ruin of Julia, the youngest daughter of Germanicus, Seneca, who was compromised by her downfall, was banished to Corsica, 41 A.D. There eight weary years of waiting were relieved by study and authorship, with occasional attempts to procure his return by such gross flattery of Claudius as is found in the work *Ad Polybium dé Consolatione* or the panegyric on Messalina which he afterward suppressed. At length the tide turned; the next empress, Agrippina, had him recalled, appointed prætor, and intrusted with the education of her son Nero, then (48) eleven years old. Seneca became, in fact, Agrippina's confidential adviser; and his pupil's accession increased his power. He was consul in 57, and during the first bright years of the new reign, the incomparable *quinquennium Neronis*, he shared the actual administration of affairs with the worthy Burrus. In the course of time Nero got to dislike him. The death of Burrus, in 62, gave a shock to his position. In vain did he petition for permission to retire, offering to Nero at the same time his enormous fortune. Even when he had sought privacy on the plea of ill-health he could not avert his doom; on a charge of being concerned in Piso's conspiracy he was forced to commit suicide. This occurred in 65 A.D. His manly end might be held in some measure to redeem the weakness of his life but for the testimony it bears to his constant study of effect and ostentatious self-complacency ("conversus ad amicos, imaginem vitæ suæ relinquere testatur").

SENECA FALLS, a post village of western New York, located on the Seneca river in Seneca county, also on the Auburn branch of the New York Central railroad, forty-three miles west of Syracuse and three miles west of Cayuga Lake. The Seneca river at this point has a considerable fall, and furnishes an abundant and valuable water-power for manufacturing purposes. There are located in the village three banks, three weekly papers, six churches, many handsome private residences, stores, and buildings adapted to educational uses. The village also contains a large manufactory of steam fire-engines, also establishments extensively engaged in the manufacture of woolen goods, pumps, sash, doors, and blinds. The present population is estimated at 6,500.

SENEFELDER, ALOIS. See LITHOGRAPHY.

SENEGAL, a river of western Africa, which falls into the Atlantic about 16° N. latitude, nine or ten miles below St. Louis. It is formed at Bafulabé (13° 50′ N. latitude and 10° 50′ W. longitude) by the junction of the Ba-fing or Black River and the Ba-khoy or White River. The Ba-fing, which has a width at the confluence of 1,475 feet, descends from the highlands of Futa-Jallon by a northward course of about 350 miles, during which it passes by a series of rapids from the altitude of 2,460 feet, at which it takes its rise, to that of 360 feet, and receives from the right the Nunkolo and the Funkumah (with its tributary the Boki). The Ba-khoy, 800 feet wide at the confluence, has been previously flowing from east to west and gives that general direction to the Senegal, but its source is away in the southeast behind the country of Buré. That of its principal tributary, the Ba-ule (Red River) is more to the east and lies within a few miles of the course of the Niger in the Mandingo plateau. Below Bafulabé the Senegal, flowing northwest, passes a succession of falls—those of Guina (160 feet) and of Felu (50 or 60)—and arrives at Médine, after having accomplished 440 of its total course of 1,000 miles. It receives only two important affluents—from the right the "marigot" of Kulu, which comes from Kuniakhary, draining the slopes of the Kaarta plateau, and from the left the Falemé, which rises in the Futa-Jallon between Labé and Timbo and flows northwest in a permanent stream. Below Médine the Senegal presents a series of great reaches, which become more and more navigable as they approach the sea.

SENEGAL, a French colony of western Africa, composed of lines of fortified posts and a loose agglomeration of states and territories in various degrees of subjugation. The forts extend (*a*) from St. Louis at the mouth of the Senegal to Bammako on the Niger, (*b*) along the coast of the Atlantic between St. Louis and the mouth of the Salum to the south of Cape Verd, and (*c*) along the so-called rivers of the south which fall into the ocean between the Gambia and SIERRA LEONE, (*q.v.*) French influence is fully dominant along those lines either in the form of actual territorial possession or of a recognized protectorate.

The colony is ruled by a governor, sends a deputy to the French legislature, and elects a general council of sixteen members, ten for the electoral district of St. Louis, four for that of Gorée-Dakar, and two for that of Rufisque. The three communes just named have each its municipal council. The population of those French possessions was in 1884 197,644—46,364 urban, 143,200 rural, 8,080 "floating." In the whole number there were only 1,474 Europeans, of whom 1,461 were French. The population of the protected countries cannot be ascertained. The most important places in the colony are St. Louis (18,924 inhabitants in 1883), Dagana (5,375), Rufisque (4,244), Médine (3,000), Joal (2,372), Gorée and Dakar (each 2,000).

SENEGAMBIA, a country in the west of equatorial Africa, comprising, as the name indicates, the regions watered by the Senegal and the Gambia. It lies between 9° and 17° N. latitude and 6° and 17° 30′ W. longitude, being bounded on the north by the Sahara, west by the Atlantic, south by Sierra Leone, and east by the Joliba or upper Niger. The area is estimated at about 400,000 square miles.

The climate is far from being so unhealthy as is frequently asserted. Except when yellow fever is raging, Europeans may live there as satisfactorily as at home. There are two seasons, the dry season and the rainy season or winter, the latter contemporaneous with our summer. Along the seaboard the dry season is cool and agreeable; in the interior it is mild only for the three months which correspond to our winter, and then it becomes a time of intolerable heat. The annual temperature increases as we advance south and more rapidly as we advance east into the interior, except, of course, where an ascent is made to higher altitudes.

The king of the Senegambian trees is the baobab (*Adansonia digitata*), which sometimes at the height of 24 feet has a diameter of 34 feet and a circumference of 104. Acacias are very numerous, one species, *A. Adansonia*, being indeed the commonest of all Senegambian trees and valuable for its ship-timber. Among the palm-trees the *ronier* deserves to be mentioned, as the wood resists moisture and the attacks of insects; in some places, as in Cayor, it forms magnificent forests. The wood of the cailcedra (*Khaya senegalensis*), a tall tree, is used in joiner's work and inlaying, and its bark furnishes a bitter tonic. The mampatas grows sometimes 100 feet high, its branches beginning only at a height of about 25 feet. The tree producing the famous kola-nut grows on the banks of the southern streams. It is almost needless to mention the m'bilor, the gonat, the mimosa, fig-trees, orange-trees, cocoa-palms, mango trees, pomegranates, sycamores, and so on. The dimb, the neteru, the tiamanoi, the dimbguton, the gologne, the n'tabo yield edible fruits. The cultivated plants are millet, rice, tobacco, haricots, ground-nuts, indigo (wild indigo is also abundant), cotton (also found wild), maize, sugar-cane, and the butter-tree or karité.

The Senegambian lion is quite different from the Barbary lion. Its color is a deeper and brighter yellow, and its mane is neither so thick nor so long. Other beasts of prey are the leopard, the wild cat, the cheetah, the civet, and the hyæna. The wild boar is clumsier than the European variety. Antelopes and gazelles occur in large herds all through upper Senegambia; the giraffe is common in the region of the upper Senegal; the elephant is rare; the hippopotamus is gradually disappearing. Crocodiles swarm both in the upper Senegal and in the upper Niger. Monkeys and apes of different species (the chimpanzee, the colobus, the cynocephalus, etc.), the squirrel, rat, and mouse abound. The hedgehog, marmot, porcupine, hare, rabbit, etc., are also met with. Among the more noteworthy birds are the ostrich, which migrates to the Sahara; the bustard, occurring in desert and uncultivated districts; the marabout, a kind of stork, with its beak black in the middle and red at the point, which frequents the moist meadow lands and the lagoons; the brown partridge, the rock partridge, and the quail in the plains and on the mountain sides; and the guinea-fowl in the thickets and brushwood. Along the coast are caught the sperm whale, the manatee, and the codfish. The domestic animals are the horse, ass, ox, sheep, goat, dog, and camel.

The population of Senegambia cannot be ascertained with any approach to accuracy, but it may be roughly stated at from ten to twelve millions. It comprises three distinct races—the Moor, the Negro, and the European. The Moors, or rather Berbers (Trarzas, Braknas, and Duaish), belong strictly to the right bank of the Senegal, and appear in Senegambia only exceptionally. The Negroes form the bulk of the population. They are divided into Pouls (Peuls, Fulbe, Fulah, or Fellatah), Toucouleurs, Mandingoes, Sarakolés, Wolofs, Sereres, Diolas, Bambaras, Balantes, Biafares, Papels, Nalus, Landumans, Bagas, and Susus. The Pouls inhabit Futa, Damga, Bondu, and Futa-Jallon; they have a reddish complexion and almost straight hair, their body fairly stout, but their limbs slim. They are gentle and hospitable, but addicted to theft. The Toucouleurs, Poul half-breeds, belonging originally to Futa-Jallon, are similar to the Negro proper; they are treacherous, warlike, fond of plunder, and fanatical in their Mohammedanism. The Mandingoes or Malinkés inhabit the basins of the upper Niger and the upper Senegal, and the western slope of the mountains of Futa-Jallon. They comprise the Mandingo proper, occupying Manding, and the Malinkés and Soninkés, scattered about Bambuk, Buré, and Fuladugu. Under the name of Wakore or Wangara they are also found in all the immense tract which extends to the north of the Kong mountains. They are tall of stature and of great muscular strength. The Sarakoles are one of the branches of the Bambara race produced by crossing with the Pouls. Their character is mild and pacific. Scattered about in Guoy, Kamera, and Guidimakha, they are fond of trade and engage in it with activity. The Wolofs and the Sereres inhabit the sea-board from St. Louis to Cape Verd and the left bank of the Senegal from its mouth to Richard Toll and Dagana. They are tall and robust, with black and glossy skin. Most of them are fetishists. The Diolas have flat noses, thick lips, harsh features, and a prominent belly; the body is tattooed. The Bambaras, who have invaded Kaarta and Khasso, have a coppery black complexion and frizzly hair; their cheeks are marked with deep scars. The Balantes inhabit the left bank of the Cassamance; they are as cruel and as fond of pillage as the Mandingoes, but are more generous toward the vanquished. The Biafares live on the banks of the Rio Grande, and the Papels in the valley of the Cacheo and the Geba. The Nalus and the Landumans are tributary to the French ports of the Rio Nuñez and the Rio Pongo. Islam is gradually detaching them from fetishism. The Bagas occupy the coast between the Rio Nuñez and the Rio Pongo. The Susus formerly dwelt on the upper Niger, but they were expelled by the invasion of the Mohammedans and are at the present time settled in the valley of the Rio Pongo.

SENIOR, Nassau William, English political economist, was born at Compton, Berks, on September 26, 1790. On the foundation of the professorship of political economy at Oxford in 1825, Senior was elected to fill the chair, which he occupied till 1830, and again from 1847 to 1852. In 1830 he was requested by Lord Melbourne to inquire into the state of combinations and strikes, to report on the state of the law, and to suggest improvements in it. He was a member of the Poor Law Inquiry Commission of 1832, and of the Handloom Weavers Commission of 1837; the report of the latter, published in 1841, was drawn up by him, and he embodied in it the substance of the report he had prepared some years before on combinations and strikes. He was also one of the commissioners appointed in 1861 to inquire into popular education in England. Senior was for many years a frequent contributor to the *Edinburgh Quarterly*, *London* and *North British Reviews*, dealing in their pages with literary as well as with economic and political subjects. He died at Kensington on June 4, 1864.

SENLIS, a town of France, in the department of Oise, lies on the right side of the Nonette, a left-hand affluent of the Oise, thirty-four miles north-northeast of Paris by the Northern railway on the branch line (Chantilly-Crépy) connecting the Paris-Creil and Paris-Soissons lines. In 1881 it had only 6,870 inhabitants; but its antiquity, its historical monuments, and its situation in a beautiful valley, in the midst of the three great forests of Hallatte, Chantilly, and Ermenonville, render it interesting.

Senlis can be traced back to the Gallo-Roman township of the Silvanectes which afterward became Augustomagus. Christianity was introduced by St. Rieul at the close of the third century. During the first two dynasties of France Senlis was a royal residence. After the dismemberment of the Carlovingian empire it belonged to the counts of Vermandois and then to the royal domain, and obtained a communal charter in 1173. Its bishop, Guérin, elected in 1214, signalized himself at the battle of Bouvines. The burgesses took part in the Jacquerie of the fourteenth century, then sided with the Burgundians and the English, whom, however. they afterward expelled. The Leaguers were there beaten by the duke of Longueville and La Noue. In the time of Henry IV. the local manufactures employed 200 masters and 4,000 men, but all industrial activity has now disappeared. The bishopric was suppressed at the Revolution, and this suppression was confirmed by the Concordat.

SENNA (Arab. *saná*), a popular purgative, consisting of the leaves of two species of *Cassia*, viz., *C. acutifolia*, Del., and *C. angustifolia* Vahl. *C. acutifolia* is a native of many districts of Nubia, *e.g.*, Dongola, Berber, Kordofan, and Senaar, but is grown also in Timbuctoo and Sokoto.

Senna appears to have been introduced into Europe about the ninth century by Arabian physicians, by whom, however, the pods seem to have been preferred to the leaves. The medicinal activity of senna leaves appears to be due to a very unstable colloid glucoside to which the name of cathartic acid has been given. In the free state it is soluble in dilute alcohol and in water, forming a brown solution, but it is almost insoluble in strong alcohol and entirely so in ether and chloroform. Combined with ammonia it forms an active purgative.

SENNACHERIB. See Babylonia, and Israel.

SENNÁR. See Senaar.

SENS, a town in France, chef-lieu of an arrondissement in the department of Yonne, lies on the right side of the Yonne near its confluence with the Vanne, and on the railway from Paris to Lyons, seventy miles southeast of the former city at the intersection of the line from Orleans to Troyes. It derives its importance from its antiquity and its archiepiscopal see. The population in 1881 numbered 13,440.

SENSITIVE PLANT. See Mimosa.

SEONI, or Seonee, a British district of India, in the Central Provinces, lying between 21° 36′ and 22° 58′ N. latitude and 79° 14′ and 80° 19′ E. longitude, with an area of 3,247 square miles, is bounded on the north by Jabalpur, on the east by Mandla and Bálághát, on the south by Nágpur and Bhandára, and on the west by Narsinhpur and Chhindwára.

The census of 1881 returned the population of Seoni district at 334,733 (males 167,925, females 166,808); of these 179,705 were Hindus, 13,442 Mohammedans, 99 Christians, and 139,444 aboriginals. Seoni (*q.v.*) is the only town with a population exceeding 10,000. Of the total district area of 3,247 square miles only 1,098 are cultivated, and of the portion lying waste 613 are returned as cultivable. Wheat forms the staple crop; rice and other food-grains are also extensively grown; and among miscellaneous products are cotton, fibers, and sugar-cane. Trade is chiefly carried on by means of markets in the towns. Manufactures consist of coarse cloth and some pottery of superior quality made at Kánhiwára. At Khawása, in the midst of the forest, leather is beautifully tanned.

SEONI, principal town and administrative headquarters of the above district, is situated in 22° 5′ 30″ N. latitude and 79° 35′ E. longitude, midway between Nágpur and Jabalpur. It was founded in 1774 by Mohammed Amín Khán, and contains large public gardens, a fine market-place, and a handsome tank. In 1881 the population was 10,203.

SEPIA is a valuable and much used deep brown pigment obtained from the ink-sacs of various species of CUTTLE-FISH (*q.v.*); that from which it is principally obtained is *Sepia officinalis*, a native of the Mediterranean, and especially abundant in the upper parts of the Adriatic, where it is a prized article of food. To obtain sepia the ink-sac is, immediately on the capture of the animal, extracted from the body and speedily dried to prevent putrefaction. The contents are subsequently powdered, dissolved in caustic alkali, and precipitated from the solution by neutralizing with acid. The precipitate after washing with water is ready to make up into any form required for use.

SEPOY, the usual English spelling of *sipáhi*, the Persian and Urdú term for a soldier of any kind. Toward the middle of the eighteenth century efforts were made by the East India Company to train natives of good caste, both Hindus and Mohammedans, for military service under the company. Though they were made to use the musket, they remained for some time chiefly armed in the fashion of the country, with sword and target; they wore the Indian dress—the turban, vest, and long drawers—and were provided with native officers under English superior command. Under their European leaders they were found to do good service and to face danger with constancy and firmness. In the progress of time a considerable change took place, and natives of every description were enrolled in the service. Though some corps that were almost entirely formed of the lowest classes achieved considerable reputation for valor in the field, it was not considered safe to encourage the system; and the company reverted to their practice of recruiting from none but the most respectable classes of native society.

SEPTEMBER, the seventh month of the old Roman year, had thirty days assigned to it. By the Julian arrangement, while retaining its former name and number of days, it became the ninth month. September was called "harvest month" in Charlemagne's calendar, and it corresponds partly to the Fructidor and partly to the Vendémiaire of the first French republic.

SEPTICÆMIA. After a wound, whether the result of accident or of operation by the surgeon, blood-poisoning may occur. Sepsis or putrefaction in the wound is the most evident local condition which has been associated by clinical observers with blood-poisoning, and hence the term "septicæmia." Within recent years the relation of micro-organisms to the different forms of blood-poisoning has come prominently into notice; putrefaction is now known to be only one of the fermentative changes due to the presence of certain micro-organisms in a wound, and it is admitted that there are many organisms which, when they enter a wound, may give rise there to fermentative changes that are non-putrefactive. Organisms have recently been divided into two great groups—those which can only grow in dead or decaying matter and those which can grow in the living tissues and in the blood, which in this relation must be looked upon as a tissue. The first group has been termed "saprophytic." The second group may be termed "pathogenic," to distinguish them from the saprophytic variety. But no distinct line of demarcation can yet be drawn between these two groups, and as a matter of fact some pathogenic organisms may equally with the saprophytic find a pabulum in dead and decaying matter.

The pathogenic organism, however, has another power which gives rise to an entirely separate condition. Not only may it form its ptomaine in the wound, but the organism itself can enter into and be carried by the blood-stream and lymph-stream to distant parts. It can live in the blood or lymph-stream and can grow there; it may be arrested in the capillaries of the blood-vessels, or in the lymphatic glands of the lymph-vessels, and in these situations may form, so to speak, a colony of organisms which develop and form ptomaines; and the ptomaines, passing into the blood, may still further poison the patient. This power of the pathogenic organism is infective, and the term "infection" has been applied to the process. These colonies or secondary foci of infection often go on to suppuration; hence the term "secondary" applied to the abscesses which have long been observed in some forms of blood-poisoning. It was at one time thought that the pus-cells in the original wound passed into the blood, and, being caught in the capillaries, were the cause of the abscess-formation in the parts distant from the wound; hence the term "pyæmia" or pus in the blood. The pus-cells may enter the blood-stream; it is not, however, the cellular element that is the essence of the condition; but the organism which the cellular element may carry along with it. The hectic condition observed in a case of long-continued suppuration is in all probability a chronic form of blood-poisoning. In very acute cases, in which the poison is either concentrated, virulent, or in large quantity, death may occur within a very few hours. In other cases the condition may become chronic, and if the strength of the patient can be kept up by stimulants recovery often takes place. The chances of recovery are much greater when the condition is not truly an infective one.

SEPTUAGINT. The Septuagint (*οἱ ό*, LXX.) or Alexandrian version of the Old Testament seems to be named from the legend of its composition by seventy, or more exactly seventy-two, translators. In the *Letter of Aristeas* (Aristæus) this legend is recounted as follows: Demetrius Phalereus, keeper of the Alexandrian library, proposed to King Ptolemy II. Philadelphus to have a Greek translation of the Jewish law made for the library: The king consented and sent an embassy, of which the author of the letter was a member, to the high priest Eleazar at Jerusalem asking him to send six ancient, worthy, and learned men from each of the twelve tribes to translate the law for him at Alexandria. Eleazar readily consented and sent the seventy-two men with a precious roll of the law. They were most honorably received at the court of Alexandria and conducted to the island (Pharus), that they might work undisturbed and isolated. When they had come to an agreement upon a section Demetrius wrote down their version; the whole translation was finished in seventy-two days. The Jewish community of Alexandria was allowed to have a copy, and accepted the version officially—indeed a curse was laid upon the introduction of any changes in it.

There is no question that this *Letter* is spurious. Aristeas is represented as a heathen, but the real writer must have been a Jew and no heathen.

The next direct evidence which we have as to the origin of the LXX. is the prologue to Ecclesiasticus, from which it appears that about 130 B.C. not only the law but "the prophets and the other books" were extant in Greek. With this it agrees that the most ancient relics of Jewish-Greek literature, preserved in the extracts made by Alexander Polyhistor (Eus., *Præp. Ev.*, ix), all show acquaintance with the LXX. These later translations, too, were not made to meet the needs of the synagogue, but express a literary movement among the Hellenistic Jews, stimulated by the favorable reception given to the Greek Pentateuch, which enabled the translators to count on finding an interested public. If a translation was well received by reading circles among the Jews, it gradually acquired public acknowledgment and was finally used also in the synagogue, so far as lessons from other books than the Pentateuch were used at all. But originally the translations were mere private enterprises, as appears from the prologue to Ecclesiasticus and the colophon to Esther. It appears also that it was long before the whole Septuagint was finished and treated as a complete work.

The Septuagint came into general use with the Grecian Jews even in the synagogue. Philo and Josephus use it, and so do the New Testament writers. But very early small corrections seem to have been introduced, especially by such Palestinians as had occasion to use the LXX., in consequence partly of divergent interpretation, partly of differences of text or of pronunication (particularly of proper names). The Old Testament passages cited by authors of the first century of the Christian era, especially those in the Apocalypse, show many such variations from the Septuagint, and, curiously enough, these often correspond with the later versions (particularly with Theodotion), so that the latter seem to rest on a fixed tradition. Corrections in the pronunication of proper names so as to come closer to the Massoretic pronunciation are especially frequent in Josephus. Finally a reaction against the use of the Septuagint set in among the Jews after the destruction of the temple—a movement which was connected with the strict definition of the canon and the fixing of an authoritative text by the rabbins of Palestine. But long usage had made it impossible for the Jews to do without a Greek Bible, and to meet this want a new version was prepared corresponding accurately with the canon and text of the Pharisees. This was the version of Aquila, which took the place of the Septuagint in the synagogues, and long continued in use there. A little later other translations were made by Jews or Jewish Christians, which also followed the official Jewish canon and text, but were not such slavish reproductions as Aquila's version; two of these were Greek (Theodotion, Symmachus) and one Syriac (Peshito).

Meantime the Greek and Latin Christians kept to the old version, which now became the official Bible of the Catholic church. Yet here also, in process of time, a certain distrust of the Septuagint began to be felt, as its divergence from the Jewish text was observed through comparisons of the younger versions based on that text, or came into notice through the frequent discussions between Jews and Christians as to the Messianic prophecies. On the whole the Christians were disposed to charge the Jews with falsifying their Scriptures out of hatred to Christianity—a charge which has left its echoes even in the Koran. But some less prejudiced scholars did not share this current view, and went so far in the other direction as simply to identify the Jewish text with the authentic original. Thus they fell into the mistake of holding that the later Jewish text was that from which the Septuagint translators worked, and by which their work was to be tested and measured. On these critical principles Origen prepared his famous *Hexapla*, in which he placed alongside of the Septuagint, in six parallel columns, the three younger versions and the Hebrew text in Hebrew and in Greek characters. The Septuagint text he corrected after the younger versions, marking the additions of the LXX. with a prefixed obelus (—, ÷), as a sign that they should be deleted, and supplying omissions, generally from Theodotion, with a prefixed asterisk (*). The end of the passage to which the obelus or asterisk applied was marked with a metobelus (⋌). The same signs were used for various readings, the reading of the LXX. being obelized, and the variant, from another version corresponding to the Hebrew text, following it with an asterisk. It was only in simpler cases, however, that this plan could be carried through without making the text quite unreadable; the more complicated variations were either tacitly corrected or left untouched, the reader being left to judge of them by comparing the parallel columns. Origen made most change in the proper names, which he emended in conformity with the Jewish pronunciation of the period, and in the order of the text, which, to preserve parallelism in the columns, he made to follow the Hebrew.

Not long after Origen there arose almost contemporaneously three recensions of the Septuagint, which became established in three regions of the Greek Church. The text of Eusebius is said to be that of Origen, *i.e.*, a separate edition of the fifth column of the Hexapla, which contained the Septuagint with asterisks and obeli. The text of Hesychius has not yet been identified with certainty; that of Lucian is, according to Field and Lagarde, most probably given in *Codd. Holmes.*, 19, 82, 93, 108, and another series of MSS. for the prophets. It is by no means the case, however, that all our MSS. can be arranged in three families; many belong to none of the three recensions, and among these are such important codices as the Alexandrian (A) and the Vatican (B).

The LXX. is of great importance in more than one respect; it is probably the oldest translation of considerable extent that ever was written, and at any rate it is the starting-point for the history of Jewish interpretation and the Jewish view of Scripture. And from this its importance as a document of exegetical tradition, especially in lexical matters, may be easily understood. It was in great part composed before the close of the canon—nay, before some of the Hagiographa were written—and in it alone are preserved a number of important ancient Jewish books that were not admitted into the canon. As the book which created, or at least codified, the dialect of Biblical Greek, it is also the key to the New Testament and all the literature connected with it. But its chief value lies in the fact that it is the only independent witness for the text of the Old Testament which we have to compare with the Massoretic text.

SEPULCHER, CANONS REGULAR OF THE HOLY, an order founded in 1114 by Arnold, patriarch of Jerusalem (or according to another account in 1099 by Godfrey of Bouillon), on the rule of St. Augustine. It admitted women as well as men, and soon spread rapidly over Europe. In the seventeenth century it received a new rule from Urban VIII. Shortly after this the canons became extinct; but the canonesses are still to be found in France, Baden, and the Netherlands. They live a strictly monastic life and devote themselves mainly to the work of education.

SEPULCHER, KNIGHTS OF THE HOLY, an English military order which was said to date from the twelfth century and which became extinct at the Reformation. A similar order, founded in France, lasted from the end of the fifteenth century till the time of the Revolution; it was resuscitated by Louis XVIII. in 1814, but again became extinct in 1830.

SEPULCHER, THE HOLY, the rock-cut tomb in which, after His crucifixion, the body of our Lord was placed. Few questions of topography have been debated with greater persistence, or, in many cases, with greater bitterness, than that of the site of this tomb. Only a brief sketch of the leading features of the controversy can be given here.

The only information on the subject to be gained from the New Testament is that the tomb was in a garden "in the place where Christ was crucified" (John xix. 41), which again was "near the city" (John xix. 20) and "without the gate" (Heb. xiii. 12), and that the watch, proceeding from the sepulcher to the chief priest's, "came *into* the city" (Matt. xxviii. 11). The first requisite, therefore, of any locality professing to be that of the Sepulcher is that it should, at the date of the crucifixion, have been *without* the walls of Jerusalem.

The existing church of the Holy Sepulcher, which is admitted on all hands to have occupied the same site for the last 800 years, is in the heart of the present town, 300 yards from the nearest point of the existing wall and in the immediate vicinity of the bazaars.

The main question on which the dispute has turned is the circuit of the walls at the time of Christ. The city at that date was surrounded by two walls. The first or oldest began, according to Josephus, "in the north, at the tower called Hippicus, and extended to what was termed the Xystus; it then formed a junction with the council house, and terminated at the western colonnade of the temple." By almost all the writers on either side this northern portion of the first wall is traced along the southern side of the depression, which extends from the central valley eastward to the Jaffa gate. From some point in that northern line of wall the second wall took its departure, and of it all we are told by Josephus is that "it had its beginning at the gate called Gennath, belonging to the first wall, and reached to the Antonia, encircling only the western quarter of the city." If this Gennath gate was near Hippicus, the line of the second wall, in order to exclude the present site, must be drawn along a route curiously unsuited, from the slope of the hill, for defensive purposes; and that it was near Hippicus seems demonstrable from the declaration of Josephus that the city in his time was "fortified by three walls except where it was encompassed by impassable ravines;" from the absence of any record of an attack on the first wall till the second had been taken; from a variety of incidental references in the siege by Titus; from the apparent necessity of including within its circuit the pool Amygdalon, now known as Hezekiah's Pool or Birket Hamman el-Batrak; and from the remarkably small area which would otherwise be included by it.

Writers on both sides have pressed into their service the remains of ancient buildings found in the districts traversed by the second wall according to their respective theories. It seemed doubtful, till quite recently, if any sound argument could be based on these, the ruins being too fragmentary and occurring in too many different quarters to warrant any positive identification with a line of fortification as distinguished from other edifices. But in the summer of 1885 a stretch of ancient wall forty or fifty yards in length was disinterred, running northward from the open space within the Jaffa gate to the west of Hezekiah's Pool, which certainly, as figured in the January number of the *Quarterly Reports* of the Palestine Exploration Fund, seems to go a long way to settle the question against the genuineness of the existing site.

In 1847 Fergusson, in his *Essay on the Ancient Topography of Jerusalem*, attempted to show that Constantine had built his memorial church on another site altogether, and that it was still existing under another name. On the eastern hill of the city, in the sacred Mohammedan inclosure of the Harám-es-Sherif, and on a spot generally considered to have formed part of the temple area, stands the magnificent octagonal building called the Dome of the Rock, usually but erroneously believed to have been erected by the caliph 'Omar, and so popularly known as the mosque of 'Omar. The jealousy of the Moslems had, with rare exceptions, prevented up to quite recent times the intrusion of Christians within its sacred precincts, but it was known to have been erected over a large mass of native rock rising above the surface of the ground and having a cave within it. A section of the building, very roughly executed, was given in the *Travels of Ali Bey*, published in 1816 (vol. ii. p. 74); but in 1833 Mr. Cotherwood, under the pretext of being a civil engineer in the employment of Mehemet Ali, and of examining into the structural condition of the building with a view to its repair, spent three weeks in examining it and its surroundings, of which he made elaborate drawings and sections. A general account of his investigations and their results, published in W. H. Bartlett's *Walks About the City and Environs of Jerusalem* (p. 148), led to Fergusson's getting access to those drawings, which confirmed him in the belief he had already begun to entertain from other sources, that the Dome of the Rock was originally a Christian edifice; and in the essay referred to he argued at great length and with much vigor on both architectural and historical grounds that it and the Golden Gateway—a walled-up entrance to the Harám from the east—were built in the time of Constantine; that the former was the church of the Anastasis, erected by that emperor over the tomb of our Lord, and the latter the entrance to the atrium of the great basilica described by Eusebius as immediately adjoining; and that the transference of the site from the eastern to the western hill took place somewhere about the commencement of the eleventh century, when, in consequence of the invasion of the Turks, the Christians were driven from the former hill for a time. This work was followed up by his article *Jerusalem* in Smith's *Dictionary of the Bible* and by several minor publications; and the whole question was, with some modifications, re-argued by him at great length in *The Temples of the Jews and the other Buildings in the Haram Area at Jerusalem* in 1878.

Though at first Fergusson's essay seemed to fall dead, it inaugurated a discussion which has within the last thirty years been carried on with much keenness. His views have been supported on architectural grounds by Unger, and on general grounds by Sandie, Smith, and Langlois, while among the multitude of his opponents may be specially noted Williams, Lewin, the Abbé Michon, De Vogüé, Pierotti, Sir Charles Warren, and Captain Conder.

Within the last few years a third locality has been suggested. In 1878 Captain Conder, in his *Tent Work in Palestine* (i. pp. 372–376), expressed a strong conviction that the real site was to be found on a rocky knoll outside the northern wall, and close to the cave known as "Jeremiah's Grotto." He argued that not only did this locality meet the requirements of the Gospel narratives, being outside the city and near one of the great roads leading from the country, but that in this direction lay "the great cemetery of Jewish times" as testified by "the sepulcher of Simon the Just preserved by Jewish tradition," and the monument of Helena "fitted with a rolling stone such as closed the mouth of the Holy Sepulcher." Here also by early

Christian tradition had been the scene of the martyrdom of Stephen, which doubtless occurred at the place of public execution, and to this day, according to Doctor Chaplin, the Jews designate the knoll "by the name Beth has-Sekilah, 'the place of stoning' (domus lapidationis), and state it to be the ancient place of public execution mentioned in the Mishnah." The hill itself appears to present a striking resemblance to a human skull, and so to associate itself with the word "Golgotha." The adoption of this site by Doctor Chaplin, the Rev. S. Merrill, Schick, and perhaps especially the late General Gordon, has aided in giving it a considerable popularity. It is, however, a purely conjectural location, and involves the assumption that all the Christian writers from the fourth century downward, as well as the mother of Constantine, were in error as to the real site.

SEQUESTRATION. See Bankruptcy.

SEQUOIA, a genus of conifers, allied to *Taxodium* and *Cryptomeria*, forming one of several surviving links between the firs and the cypresses. The two species usually placed in this group are evergreen trees of large size, indigenous to the west coast of North America. Both bear their round or ovoid male catkins at the ends of the slender terminal branchlets; the ovoid cones, either terminal or on short lateral twigs, have thick woody scales dilated at the extremity, with a broad disk depressed in the center and usually furnished with a short spine; at the base of the scales are from three to seven ovules, which become reversed or partially so by compression, ripening into small angular seeds with a narrow wing-like expansion.

The redwood of the Californian woodsmen, *S. Sempervirens*, which may be regarded as the typical form, abounds on the Coast Range from the southern borders of the State northward into Oregon, and, according to De Candolle, as far as Nootka Sound. It grows to a gigantic size: a trunk has been recorded 270 feet in length, and a greater height is said to be occasionally reached, while a diameter of from 12 to 15 feet is sometimes attained at the base. In old age the huge columnar trunk rises to a great height bare of boughs, while on the upper part the branches are short and irregular. The bark is red, like that of the Scotch fir, deeply furrowed, with the ridges often much curved and twisted. When young the tree is one of the most graceful of the conifers: the stem rises straight and tapering, with somewhat irregular whorls of drooping branches, the lower ones sweeping the ground—giving an elegant conical outline. The twigs are densely clothed with flat spreading linear leaves of a fine glossy green above and glaucous beneath; in the old trees they become shorter and more rigid and partly lose their distichous habit.

The only other member of the genus is the giant tree of the Sierra Nevada, *S. gigantea*, the largest of known conifers; it is confined to the western portion of the great Californian range, occurring chiefly in detached groups locally called "groves," at an altitude of from 4,000 to 5,000 feet above the sea.

The famous group known as the Mammoth Grove of Calaveras in California, containing above ninety large trees, stands in 38° N. latitude, about 4,370 feet above the sea, between the San Antonio and Stanislaus rivers. According to Vischer, it was discovered by a hunter in pursuit of a bear in 1852, but had apparently been visited before, as the date 1850 is cut on one of the trees. The bark of one of the finest trunks was foolishly stripped off to the height of 116 feet, and exhibited in New York and London; it now stands in the Crystal Palace, Sydenham. The tree, known as the "mother of the forest," soon died; at the base it measured ninety feet in girth, and the dead tree was 321 feet high; a prostrate trunk in the neighborhood is eighteen feet in diameter 300 feet from the base. Some trees in the Mariposa grove rival these in size; one measures 101 feet round the root, and a cut stump is thirty-one feet in diameter. Gigantic as these trees are and imposing from their vast columnar trunks, they have little beauty, owing to the scanty foliage of the short rounded boughs; some of the trees stand very close together; they are said to be about 400 in number. Some are of vast age, perhaps 3,000 years or more; they appear to be the remains of extensive woods belonging to a past epoch, and probably have been in distant time much injured by forest fires. The growth of the "mammoth tree" is fast when young, but old trees increase with extreme slowness.

SERAIEVO. See Bosna Serai.

SERAING, a town of Belgium, stretching nearly a mile along the right bank of the Meuse, across which a suspension bridge connects it with Jemeppe, three miles southwest of Liége. It has one of the largest manufactories of machinery on the Continent, founded by John Cockerill, an Englishman, in 1817, on the site of the former palace of the prince-bishops of Liége. The population, which numbered but 2,226 in 1827, amounted to 24,315 in 1877, and is now (1890) estimated at about 27,500.

SERAMPUR, a town of British India, in Hugli (Hooghly) district, Bengal, situated on the right bank of the Hugli river, thirteen miles by rail north of Calcutta, in 22° 45′ 26″ N. latitude, and 88° 23′ 10″ E. longitude. At the census of 1881 the population of the town was 25,559 (13,137 males and 12,422 females).

SERAPHIM. In the vision of Isaiah vi. the throne of God is surrounded by seraphim—figures apparently human (ver. 6), but with six wings, which constantly proclaim the *trisagion*. The seraphim are not again mentioned in the Bible; but in later Jewish theology they are taken to be a class of angels. As the whole vision of Isaiah is symbolical, the seraphim also are in this connection symbolical figures, aiding the delineation of Jehovah's awful holiness. But the imagery is probably borrowed from some popular conception analogous to that of the Cherubim, *(q.v.)*

SERAPIS, or Sarapis, in the Leyden papyus *’Οσαράπις*, *i.e.*, Osiris-Apis, apparently meaning the dead Apis worshiped as Osiris (see Apis), and so as lord of the under-world, was the name under which the Egyptian priest consulted by Ptolemy Soter incorporated with the old religion the Greek worship of Hades. The statue with the attributes of Hades which they professed to identify as Serapis (a name which had till then played no prominent part in Egyptian religion) was brought by the king from Sinope to Alexandria in consequence, it was given out, of a revelation granted to him in a dream.

SERENA, a city of Chili, capital of the province of Coquimbo, is situated on an elevated plain on the south side of the river Coquimbo, about five miles from the sea, in 29° 54′ S. latitude and 71° 13′ W. longitude. The population of Serena was 12,293 in 1875, or, including the suburbs of the Pampa (Alta and Baja), 14,403.

SERENUS of Antissa, an ancient Greek geometer, the author of two treatises—*De Sectione Cylindri et Coni libri duo*—which Halley has published in Greek and Latin along with his edition of the *Conics* of Apollonius of Perga. Great difference of opinion has existed as to his date: Halley says in his preface to the *Conics* "We know nothing of Serenus except that he was born at Antissa, a town in the island of Lesbos; and that, besides his book *On the Section of the Cylinder*, and another *On the Section of the Cone*, he wrote commentaries on Apollonius; and that he lived before Marinus—the pupil of Proclus—as appears from the preface of Marinus to the *Data* of Euclid."

SERES, Serres, or Siros, a town of Turkey in Europe, now at the head of a sanjak in the vilayet of Saloniki, is situated in the valley of the Strymon (Karasu), in a district so fertile as to bear among the Turks the name of Altin Ovassi or Golden Plain, and so thickly studded with villages as to have, when seen from the heights of Rhodope, the appearance of a great city with extensive gardens. Cloth-factories and tanneries are the chief industrial establishments and lignite mines are worked in the neighborhood with some success. The population is 30,000.

SERFDOM. See Slavery.

SERGHIEVSKIY POSAD, or Troitze-Serghievsk, a town of Russia, in the government of Moscow, which has grown up round the monastery of Troitze-Serghievskaya Lavra, forty-four miles by rail to the northeast of Moscow. It is situated in a beautiful country, intersected by pleasant little valleys and varied with woods, the buildings extending partly over the hill occupied by the monastery and partly over the valley below. Including the extensive Kukuevsk suburbs, it had in 1884 31,400 inhabitants.

SERGIUS I., pope from 687 to 701, came of an Antiochene family which had settled at Palermo, and owed his election as Conon's successor to skillful intrigues against Paschalis and Theodorus, the other candidates. Sergius was followed by John VI. as pope.

SERGIUS II., pope from 844 to 847, a Roman of noble birth, elected by the clergy and people to succeed Gregory IV., was forthwith consecrated without waiting for the sanction of the emperor Lothair, who accordingly sent his son Louis with an army to punish the breach of faith. Sergius was succeeded by Leo IV.

SERGIUS III., succeeded Pope Christopher in 904, and reigned till 911. His pontificate, so far as is known, was remarkable for nothing. After him Anastasius III. sat on the pontifical throne.

SERGIUS IV., pope from 1009 to 1012, originally bore the name of Peter, and is said to have been the first to change his name on accession to the pontificate. He was a mere tool in the hands of the feudal nobility of the city. He was succeeded by Benedict VIII.

SERGIUS, St. The Eastern and Western Churches celebrate the martyrs Sergius and Bacchus, Roman officers who suffered under Maximian, on October 7th. Both were martyred in Syria, Sergius at Rosáfa (Rasíftá, Rosáfat Hishám), near Rakka. Sergius was a very famous saint in Syria and Christian Arabia.

SERIEMA, or Cariama, a South-American bird, sufficiently well described and figured in Marcgrave's work to be recognized by succeeding ornithologists, forming a distinct genus *Cariama*.

The Seriema, owing to its long legs and neck, stands some two feet or more in height, and in menageries bears itself with a stately deportment. Its bright red beak, the bare greenish blue skin surrounding its large yellow eyes, and the tufts of elongated feathers springing vertically from its lores, give it a pleasing and animated expression; but its plumage generally is of an inconspicuous ocherous gray above and dull white beneath—the feathers of the upper parts, which on the neck and throat are long and loose, being barred by fine zigzag markings of dark brown, while those of the lower parts are more or less striped. The wing-quills are brownish black, banded with mottled white, and those of the tail, except the middle pair, which are wholly grayish brown, are banded with mottled white at the base and the tip, but dark brown for the rest of their length. The legs are red. The Seriema inhabits the *campos* or elevated open parts of Brazil, from the neighborhood of Pernambuco to the Rio de la Plata, extending inland as far as Matto Grosso (longitude 60°), and occurring also, though sparsely, in Paraguay. It lives in the high grass, running away in a stooping posture to avoid discovery on being approached, and taking flight only at the utmost need. Yet it builds its nest in thick bushes or trees at about a man's height from the ground, therein laying two eggs, which Professor Burmeister likens to those of the Land-Rail in color. The young are hatched fully covered with gray down, relieved by brown, and remain for some time in the nest. The food of the adult is almost exclusively animal—insects, especially large ants, snails, lizards, and snakes; but it also eats certain large red berries.

SERIES. A series is a set of terms considered as arranged in order. Usually the terms are or represent numerical magnitudes, and we are concerned with the sum of the series. The number of terms may be limited or without limit; and we have thus the two theories, finite series and infinite series. The notions of convergency and divergency present themselves only in the latter theory.

SERINGAPATAM, formerly the capital of Mysore, India, is situated on an island of the same name in the Káveri (Cauvery) river in 12° 25′ 33″ N. latitude and 76° 43′ 8″ E. longitude. It is chiefly noted for its fortress, which figured so prominently in Indian history at the close of the eighteenth century. This formidable stronghold of Tipu Sultan thrice sustained a siege from the British, but it was finally stormed in 1799; and after its capture the island was ceded to the British. In 1881 the population of the town of Seringapatam was 11,734 (males 5,579, females 6,155).

SERJEANT-AT-LAW is the name given to one who holds an ancient and honorable rank at the English or Irish bar. The word is a corruption of *serviens ad legem*, as distinguished from *apprenticius ad legem*, or utter barrister, who probably originally obtained his knowledge of law by serving a kind of apprenticeship to a serjeant. When the order of serjeants was instituted is unknown, but it certainly dates from a very remote period. The serjeants had their own inn of court down to a very recent date. Serjeants' Inn was formerly in two divisions, one in Fleet street and one in Chancery lane. In 1758 the members of the former joined the latter. In 1877 the latter was dissolved, the inn sold to one of the members, and the proceeds divided among the existing serjeants. The extinction of the order is now only a question of time, no serjeant having been created since 1868. It is, however, still within the discretion of the crown to create fresh serjeants if ever it should be deemed advisable to do so. In Ireland the order still exists. The three serjeants at the Irish bar have precedence next after the law officers of the crown.

SERJEANTY, a form of tenure. See Real Estate.

SERPENT, a musical instrument. See Ophicleide.

SERPENTINE, a compact crypto-crystalline or fibrous mineral substance, occurring in rock-masses which commonly present dark green colors, variously mottled and fancifully compared to the markings on certain serpents, whence the name "serpentine." For a like reason it is sometimes called "ophite," while Italian sculptors have termed it "ranocchia," in allusion to its resemblance to the skin of a frog. In consequence of its variegated tints, the stone is frequently cut and polished for ornamental purposes, and is hence popularly called a marble. From true marble, however, it differs in chemical composition, being essentially a hydrated silicate of magnesium, usually associated with certain metallic oxides (such as those of iron, nickel, and chromium) which confer upon the stone its characteristic tints. In some localties serpentine is found in masses which are evidently intrusive among other rocks, while elsewhere it occurs interbedded, usually in lenticular masses, associated with gneiss and crystalline schists. It is noteworthy that the serpentine is frequently crushed and brecciated, exhibiting polished slip-faces which are sometimes striated. The surface of an exposed mass of serpentine is generally barren, whence bosses of the rock are known in the Alps as "monts morts."

SERPENTS. See Snakes.

SERPUKHOFF, a district town of Russia, in the government of Moscow, sixty-one miles south of the city of Moscow, with which it is connected by rail. Built on high cliffs on both banks of the river Nara, three miles above its junction with the Oka, Serpukhoff has of late become an important manufacturing and commercial town.

SERTORIUS, Quintus. The life and career of the Roman Sertorius, a man of remarkable genius both as a general and as a statesman, may be said to be comprised between the years 105 and 72 B.C., a period of civil war and revolution in the Roman world, when every man of any mark had to be an adherent either of Sulla or of Marius. Sertorius, who came from a little Sabine village under the Apennines and was a self-made man, attached himself to the party of the latter, and served under him in 102 B.C. at the great battle of Aquæ Sextiæ (Aix), in which the Teutones were decisively defeated. On Sulla's return from the East and the war with Mithradates in 83, Sertorius left Rome for Spain, where he represented the Marian or democratic party, but, it would appear, without receiving any definite commission or appointment. Here he passed the remainder of his life, with the exception of some cruises in the Mediterranean in conjunction with Cilician pirates, and of the campaign in Mauretania, in which he defeated one of the Sulla's generals and captured Tingis (Tangier). This success recommended him to the Spaniards, more particularly to the Lusitanian tribes in the west, whom Roman generals and governors of Sulla's party had plundered and oppressed.

For six years he may be said to have really ruled Spain. In 77 he was joined by Perpenna, one of the officers of Lepidus, from Rome, with a following of Roman nobles, and in the same year the great Pompey, then quite a young man and merely a knight, was sent by the senate to take the command in Spain and with Metellus to crush Sertorius. The war was waged with varying success, but on the whole Sertorius proved himself more than a match for his adversaries, utterly defeating their united forces on one occasion near Saguntum. Pompey wrote to Rome for reënforcements, without which, he said, he and Metellus would be driven out of Spain. Rome's position was very critical, the more so as Sertorius was in league with the pirates in the Mediterranean, was negotiating with the formidable Mithradates, and was in communication with the insurgent slaves in Italy. But owing to jealousies among the Roman officers who served under him and the Spaniards of higher rank he could not maintain his position, and his influence over the native tribes slipped away from him, though he won victories to the last. In 72 he was assassinated at a banquet, Perpenna, it seems, being the chief instigator of the deed.

SERVANT. See Master and Servant.

SERVETUS, Michael or Miguel Serveto, physician and polemic, was born in 1511 at Tudela in Navarre. Having apparently had his early training at the university of Saragossa, he was sent by his father to study law at Toulouse, where he first became acquainted with the Bible (1528). We next find Servetus at Lyons, in 1535, as an editor of scientific works for the printing firm of Trechsel, under the name of Michel de Villeneufve or Michael Villanovanus, which he used without interruption till the year of his death. Here he found a friend in Dr. Symphorien Champier (Campegius) (1472–1539), whose profession he resolved to follow. Accordingly he went (1536) to Paris, where he studied medicine under Johann Günther, Jacques Dubois, and Jean Fernel. It was in 1536, when Calvin was on a hurried and final visit to France, that he first met Servetus at Paris, and, as he himself says, proposed to set him right in theological matters. In June, 1538, we find him at the university of Louvaine (where he was inscribed on the roll of students as Michael Villanova on December 14, 1537), studying theology and Hebrew.

Among the attendants upon his Paris lectures had been a distinguished ecclesiastic, Pierre Paulmier, since 1528 archbishop of Vienne. Paulmier invited Servetus to Vienne as his confidential physician. He acted in this capacity for twelve years (1541–53), and made money. He opened a correspondence with Calvin, and late in 1545, or very early in 1546, he forwarded to Calvin the manuscript of a revised and enlarged edition of his theological tracts, and expressed a wish to visit him at Geneva. Calvin replied on February 23, 1546, in a letter which is lost, but in which, he says, he expressed himself "plus durement que ma coustume ne porte." On the same day he wrote to Guillaume Farel: "Si venerit, modo valeat mea autoritas, vivum exire nunquam patiar," and to Pierre Viret in the same terms. Servetus had fair warning that if he went to Geneva it was at his peril. In his letter to Abel Pouppin (in or about 1547), after stating that he had failed to recover his manuscript from Calvin, he says: "Mihi ob eam rem moriendum esse certo scio." The volume of theological tracts, again recast, was declined by a Basel publisher in April, 1552, but an edition of 1,000 copies was secretly printed at Vienne. It was finished on January 3, 1553; the bulk of the impression was privately consigned to Lyons and Frankfort for the Easter market. But on February 26th a letter, inclosing a sheet of the printed book, and revealing the secret of its authorship, was written from Geneva by Guillaume H. C. de Trye, formerly *échevin* of Lyons, to his cousin Antoine Arneys in that city. This letter bears no sign of dictation by Calvin; the history of De Trye shows that it may have been instigated in part by personal ill-feeling toward the Lyons booksellers. But Calvin furnished (reluctantly, according to De Trye) the samples of Servitus' handwriting, inclosed in a subsequent letter, for the express purpose of securing his conviction. The inquisitor-general at Lyons, Matthieu Ory, set to work on March 12th; Servetus was interrogated on March 16th, and arrested on April 4th. Upon examination his defense was, that in correspondence with Calvin, he had assumed the character of Servetus for the purposes of discussion. At 4 A.M. on April 7th he escaped from his prison, evidently by connivance. He took the road for Spain, but turned back in fear of arrest. How he spent the next four months is not known; Calvin believed he was wandering in Italy; the idea that he lay concealed in Geneva was first started by Spon. On Saturday, August 12th, he rode into Louyset, a village on the French side of Geneva. Next morning he walked into Geneva, and ordered a boat, to take him toward Zurich on his way for Naples. He was recognized that day at church, and immediately arrested. The process against him lasted from August 14th to

October 26th, when sentence "estre brusle tout vyfz" was passed, and carried out next day at Champel (October 27, 1553). Calvin would have had him beheaded. Meanwhile the civil tribunal at Vienne had ordered (June 17th) that he be fined and burned alive; the sentence of the ecclesiastical tribunal at Vienne was delayed till December 23d. Jacques Charmier, a priest in Servetus' confidence, was condemned to three years' imprisonment at Vienne.

SERVIA, a kingdom belonging to the Balkan peninsula of Europe, lying between Bosnia on the west and Bulgaria and Roumania on the east, and between the Turkish province of Albania on the south and the Austrian Military Frontier on the north. From Bosnia it is separated by the Drina, from Austrian and Roumanian territory by the Danube and the Save, and from Bulgaria partly by the Timok. Some parts of the southern frontier are indicated by mountains, but elsewhere there are no natural boundaries. In shape Servia is an irregular trapezium, situated between about 42° 30′ and 45° N. latitude and 19° and 22° 30′ E. longitude. The area is about 18,760 square miles, and the population (1,667,159 in 1874) was estimated at the end of 1884 to be 1,902,419, thus giving a density of about 100 to the square mile. This low density, only about one-third of that of the United Kingdom, is explained by the nature of the surface, the inland position, the defective communications with the exterior, and the absence of manufacturing industries.

The climate of Servia is on the whole mild, though subject to the extremes characteristic of inland Eastern countries. In summer the temperature may rise as high as 106° Fahr., while in winter it often sinks to 13° or even sometimes 20° below zero. The high-laying valleys in the south are colder than the rest of the country, not only on account of their greater elevation but also because of their being exposed to the cold winds from the north and northeast. Accordingly, the chief products of the soil are such as thrive under a warm summer and are unaffected by a cold winter. Both maize and wine are grown, but the olive is excluded by the severity of the cold season.

Maize is the principal object of agriculture, the average annual crop being estimated at upward of 5,000,000 bushels, wheat coming next with an average crop of less than 4,000,000 bushels. Besides cereals, flax, hemp, and tobacco are grown, but the attempts made to cultivate cotton have proved unsuccessful. The chief wine-growing locality is in the northeast, round Negotin. Inefficient as are the implements and backward the methods of agriculture, grain makes up a considerable portion of the exports, owing to the scantiness of the population and the deficiency of other industries, and it is expected that this export will be greatly increased on the completion of the railway system to the southern seaports. The grain chiefly exported is wheat—maize supplying, as among all the Slavs of the Balkan peninsula, the chief food of the people. Hitherto live stock has formed the largest item in the exports, sometimes amounting to over one-half. Among these, pigs, which are fed in immense numbers on the mast of the forests, take the first place. Of late years their number has greatly declined, largely in consequence of American competition; but relatively to population Servia still maintains a greater number than any other country of Europe; and the same is true of sheep, which are here relatively more than twice as numerous as in Spain. Cattle also are numerous, but are reared solely as beasts of draft and for export. Bees are very generally kept—the honey being consumed in the country, the wax exported. The rearing of silkworms is spreading, especially since cocoons and eggs have begun to be exported to Italy. Orchards are very extensive, and all kinds of fruits belonging to central Europe are grown in abundance—above all the plum, from which is distilled the favorite national spirit, *slivovitza*. After live animals and grain come hides and prunes. Among the imports the chief items are sugar, salt (wholly absent in Servia), cotton goods and other textiles. Import duties being high, a considerable amount must always be allowed for smuggled goods. Though the great bulk of the imports enter the country by the Austrian frontier, an increasingly large proportion comes originally from beyond Austria-Hungary. Thus in 1879, of the total quantity of imports across the Austrian frontier, 76 per cent. were of Austrian-Hungarian origin, in 1880 73 per cent., in 1881 65 per cent., leaving 24, 27, and 35 per cent. respectively for countries beyond. Among the latter Germany comes next after Austria-Hungary, and then England. Colonial wares (sugar, coffee, etc.) are now imported cheaper by way of Hamburg than by way of Trieste.

The natural increase of population in Servia is pretty rapid, the annual birth-rate being among the highest in Europe, while the death-rate, though high, is exceeded in several other countries. The people are mainly Serbs, though the proportions have been modified by the increase of territory under the treaty of Berlin. This territory, at one time occupied by Servians, had been to a large extent deserted by them in consequence of the oppressive Turkish yoke, and their place had been taken by Mohammedan Albanians west of the Morava and by Bulgarians in the valley of the Nishava. Most of the Albanians, however, quitted their homes at the time of annexation, and Servians are now returning to their former seats. Previous to the treaty of Berlin the principal element of the population next after the Servians consisted of Roumanians, of whom there were about 130,000. The Servian Church forms a branch of the Oriental Greek Church with a perfectly independent administration. The highest ecclesiastical authority is exercised by the national synod. Elementary education is in a very backward state, but recently a law has been passed to remedy this defect, by making education obligatory on all children between six and thirteen and laying the duty of providing accommodation, books, and teachers upon school districts. At Belgrade there is a high school or university with faculties of philosophy, law, and technics.

The agricultural population is scattered among a great number of villages, most of which consists of single isolated homesteads. Each homestead is occupied by a group of families connected by blood and acknowledging one head, the *stareshina*, who is usually the patriarch of the community, but is often chosen by the rest of the members on account of his prudence and ability. He regulates the work and distributes the proceeds of the labor of the entire homestead, and his ruling is followed without question. The land cultivated by a family or group of families is always their own property. The buildings belonging to the homesteads are inclosed within an immense palisade, inside which a large expanse of fields is mostly planted with plum, damson, and other fruit-trees, surrounding the houses of the occupiers. In the midst of these is the house of the stareshina, which contains the common kitchen, eating hall, and family hall of the entire homestead. In this last all the members assemble in the evening for conversation and amusement, the women spinning, while the children play. The people take delight in listening to the recitation of the poetical rhapsodies in which the Servian literature is remarkably rich. The houses are mostly very small wooden structures, serving for little else but sleeping places. But that of the stareshina is often of brick, and is invariably of better construction than the rest.

Since March 6, 1882, the government has been a constitutional monarchy. The legislative body is called the *skupshtina*, and in 1884 consisted of 178 members, three-fourths of whom are elected by the people, the remainder being nominated by the king. A new skupshtina is elected every three years. For the settlement of special questions of great moment an extraordinary skupshtina or great national assembly is elected, in which there are four times as many members, all elected as in the ordinary skupshtina. There is also a permanent council of state of fifteen members, who have the task of drawing up proposals for legislation, hearing complaints regarding the decisions of ministers, and performing other functions. For administrative purposes the kingdom is divided into twenty-two circles, besides the city of Belgrade.

The Servian army is divided into three classes. The first class, embracing men between twenty-five and thirty years of age, constitutes the standing army, which numbers 18,000 on a peace footing and about 100,000 on a war footing. The first two years are served with the colors and the remainder of the term in the reserve. The second class contains men between thirty and thirty-seven who have served in the standing army. The third class, which is only called out in extraordinary emergencies, is composed of men between thirty-seven and fifty. The total military strength of Servia for cases of emergency is estimated to be about 210,000 men.

The capital of Servia is Belgrade, at the junction of the Danube and the Save. It is the only town with more than 15,000 inhabitants. Next in size is Nish, in the territory added by the treaty of Berlin, where the valley of the Nishava opens into that of the Bulgarian Morava. The other chief towns are Kragushevatz in the center of the Shumadia, the former capital of the country, Shabatz on the Save, Semendria on the the Danube, Krushevatz, Alexinatz (the center of the flax and hemp growing district) Ushitze, Posharevatz, Vranja and Leskovatz.

In consequence of the splendid victories of Prince Eugene, Austria acquired the greater part of Servia by the treaty of Posharevatz in 1718, but the Turks regained it by the peace of Belgrade in 1739. For upward of four centuries the Serbs groaned under the Turkish yoke, until, in 1804, unable to endure the oppression of the Turkish *dahis*, they broke out into rebellion under George Petrovich, surnamed *Tsrni*, or "Black George" (in Turkish *Kara*). Kara George was born at Topola (Tapolja) in 1767; at first he merely aimed at conquering the dahis, but afterward he attempted to drive the Turks out of Servia. This he succeeded in doing after many failures. In 1813, however, they reconquered the country, and George with his adherents was compelled to fly to Austria. He returned in 1817, but was treacherously murdered by order of Milosh Obrenovich, who had now become the Servian leader. We have no space here to sketch the struggles of Milosh to secure the independence of Servia. He was himself of peasant origin, and in his youth had been a swine-herd. The Turks had contrived to kill or drive out of the country all the Servian aristocracy, leaving only peasants to till the ground, feed the swine (one of the great industries of the country), and pay the *harach*. Milosh was declared prince by the national assembly, and in 1830 secured the consent of the Porte to his enjoyment of the title with the succession reserved to his family. Turkey allowed Servia a quasi-independence, but held and garrisoned several fortresses. Milosh had so little forgotten his Turkish training that he made himself obnoxious to his subjects by his despotic acts. He was a man of simple, even coarse habits, as many of the anecdotes told of him testify. He was compelled to abdicate in 1839 in favor of his son Milan, who, however, was of too feeble a constitution to direct the government, and, dying soon afterward, was succeeded by his younger brother Michael. He also abdicated in 1842, and the Serbs then elected Alexander, the son of Tsrni George, or, to give him his Servian patronymic, Karageorgevich. His rule lasted seventeen years; he was compelled to resign in 1859, and Milosh, now very old, was invited to come from Bucharest. He lived, however, only one year, dying in 1860, and left the throne to his son Michael, then aged forty, who was thus a second time elected prince of Servia. Michael was a man of refinement, and had learned much during his exile. The condition of the country improved during his reign, and, in 1862, he succeeded in getting the Turkish garrisons removed from Belgrade. The Moslem inhabitants have gradually withdrawn from the country, so that they are now represented by a very few families. Of the two mosques still remaining in Belgrade, one is devoted to their use, the other having been turned into a gas-work. While walking in his park, called Koshutniak or Topshidere, near Belgrade, Michael was assassinated by the emissaries of Alexander Karageorgevich, on June 10, 1868. He was succeeded by his second cousin, Milan, grand son of Yephrem, a brother of Milosh. Milan was born in 1854; he became prince of Servia in 1872. In 1875 he married a Russian lady, Natalie de Keczko, since made notorious by the attempt to divorce her. In 1878 the Serbs declared war against Turkey, but their arms were unsuccessful, and they were only saved by the intervention of Russia. By the treaty of Berlin, July, 1878, the country received a large accession of territory, and the prince caused himself to be proclaimed king.

Queen Natalie finally obtained a divorce. (See MILAN, vol. X.) In 1885 Servia declared war against Bulgaria, and was ignomiously beaten. Milan abdicated in favor of his son in 1887, and the young Prince now governs under a Council of Regents.

SERVITES (Servi Beatæ Mariæ Virginis). This religious order owes its origin to Bonfiglio Monaldi, a Florentine, who in 1233 withdrew along with six of his comrades to the Campo Marzo near the city for prayer and ascetic exercises in honor of the Virgin. Three years afterward they removed to Monte Senario, where their numbers were considerably increased. The order at a very early period received from Bishop Ardingus of Florence the rule of St. Augustine, but did not obtain papal sanction until 1255. It rapidly spread into France, Germany, the Low Countries, Poland, and Hungary, and from Martin V. it received in 1424 the privileges of the mendicant orders. The Servite Tertiaries were founded about the same time by Giuliano Falconieri. Under Bernardino de Ricciolini arose the Hermit Servites (1593). The members of the order (Observants and Conventuals) are now found chiefly in Italy, Hungary, Austria, and Bavaria.

SERVIUS, the commentator on Virgil, is all but unknown to us, so far as personal information goes. From notices in the *Saturnalia* of Macrobius, where he appears as an interlocutor, we may infer that in or about 380, though still quite young, he was already distinguished as a "grammaticus," that is, as an expert in the criticism, explanation, and teaching of the classical literature of Rome. Servius therefore belongs to the latter half of the fourth and the earlier years of the fifth century, to the age of Symmachus and Claudian, of Jerome and Augustine.

SERVIUS TULLIUS, the sixth king of Rome, described in one account as originally a slave, is said to have married a daughter of Tarquin, and to have gained the throne by the contrivance of Tanaquil, his mother-in-law. Another legend represented him as a soldier of fortune originally named Mastarna, from Etruria, who attached himself to Cæles Vibenna, the founder of an Etruscan city on the Cælian Hill. His legislation was extremely distasteful to the patrician order, and his reign of forty-four years was brought to a close by a conspiracy headed by his son-in-law Tarquinius Superbus. The street in which Tullia drove her car over her father's body ever after bore the name of the "Vicus Sceleratus."

SESAME, the most important plant of the genus *Sesamum* (nat. ord. *Pedalineæ*), is that which is used throughout India and other tropical countries for the sake of the oil expressed from its seeds. *S. indicum* is an herb two to four feet high, with the lower leaves on long stalks, broad, coarsely-toothed or lobed. The upper leaves are opposite, lanceolate, and bear in their axils curved, tubular, two-lipped flowers, each about three-fourths inch long, and pinkish or yellowish in color. The four stamens are of unequal length, with a trace of a fifth stamen, and the two-celled ovary ripens into a two-valved pod with numerous seeds. The plant has been cultivated in the tropics from time immemorial, and is supposed on philological grounds to have been disseminated from the islands of the Indian Archipelago, but at present it is not known with certainty in a wild state.

SESOSTRIS (*Σέσωστρις*, so Herodotus; Diodorus writes *Sesoosis;* other forms are *Sesonchosis*, *Sesosis*, *Sesothis*, etc.) is according to Greek historians the name of a king of Egypt who conquered the whole world, even Scythia, the lands of the Ganges, and Æthiopia, which were not subject to any of the later great empires. The conqueror in whose exploits these extravagant legends took their rise was Ramses II.; but the Greek accounts unite in his person all the greatest deeds of the ancient Pharaohs, and add much that is purely imaginary.

SESSA, a town of the kingdom of Italy, province of Terra di Lavoro, situated among hills on the site of the ancient *Suessa Aurunca*, on a small affluent of the Garigliano, is seventeen miles east of Gaeta and half a mile from Sant' Agata. Exclusive of the environs the town has a population of 6,130.

SESSION, COURT OF. A Scottish court.

SETTLE, ELKANAH, a minor English poet and playwright of the Restoration period, immortalized by the ridicule of Dryden and Pope, was born at Dunstable in 1648. He died in the Charterhouse in 1723.

SETTLEMENT, in law, is a mutual arrangement between living persons for regulating the present or future enjoyment of property. It also denotes the instrument by which such enjoyment is regulated. The prevailing notion of a settlement is the dealing with property in a manner different from that in which the law would have dealt with it apart from the settlement. The oldest form of settlement in England was perhaps the gift in frankmarriage to the donees in frankmarriage, and the heirs between them two begotten (Littleton, § 17). This was simply a form of gift in special tail, which became up to the reign of Queen Elizabeth the most usual kind of settlement. The time at which the modern form of settlement of real estate came into use seems to be doubtful. There does not appear to be any trace of a limitation of an estate to an unborn child prior to 1556. In an instrument of that year such a limitation was effected by means of a feoffment to uses. The plan of granting the freehold to trustees to preserve contingent remainders is said to have been invented by Lord Keeper Bridgman in the seventeenth century, the object being to preserve the estate from forfeiture for treason during the Commonwealth. The settlement of chattels is no doubt of considerably later origin, and the principles were adopted by courts of equity from the corresponding law as to real estate.

At the present time the settlement in England is, so far as regards real estate, used for two inconsistent purposes—to "make an eldest son," as it is called, and to avoid the results of the right of succession to real property of the eldest son by making provision for the younger children. The first result is generally obtained by a strict settlement, the latter by a marriage settlement, which is for valuable consideration if antenuptial, voluntary if post-nuptial. At the same time it should be remembered that these two kinds of settlement are not mutually exclusive: a marriage settlement may often take the form of a strict settlement and be in substance a resettlement of the family estate.

United States.—Marriage settlements are not in as common use as in England, no doubt owing to the fact that the principle of the Married Woman's Property Act was the law of most of the States of the Union long before its adoption by England. In Louisiana, in the absence of stipulation to the contrary, community of goods is the rule. Settlements other than marriage settlements are practically unknown in the United States. Property cannot, as a general rule, be tied up to anything like the extent still admissible in England. In those States where entail is allowed the entail may be barred by simple means of alienation.

SETTLEMENT, ACT OF. By this Act, 12 and 13 Will. III. c. 2, passed in 1701 (followed by the parliament of Scotland in the Act of Union, 1707, c. 7), the crown was settled upon the Princess Sophia, electress and duchess dowager of Hanover, granddaughter of James I., and the heirs of her body, being Protestants. The Act contained in addition some important constitutional provisions. Those which are still law are as follows:—(1) that whosoever shall hereafter come to the possession of this crown shall join in communion with the Church of England as by law established; (2) that in case the crown of this realm shall hereafter come to any person not being a native of this kingdom of England, this nation be not obliged to engage in any war for the defense of any dominions or territories which do not belong to the crown of England without the consent of parliament; (3) that after the limitation shall take effect no person born out of the kingdoms of England, Scotland, or Ireland, or the dominions thereunto belonging, although he be naturalized or made a denizen (except such as are born of English parents), shall be capable to be of the privy council or a member of either House of Parliament, or enjoy any office or place of trust, either civil or military, or to have any grant of lands, tenements, or hereditaments from the crown to himself, or to any other or others in trust for him; (4) that after the limitation shall take effect judges' commissions be made *quamdiu se bene gesserint*, and their salaries ascertained and established, but upon the address of both Houses of Parliament it may be lawful to remove them; (5) that no pardon under the great seal of England be pleadable to an impeachment by the Commons in parliament.

SETTLEMENT OF THE POOR. See POOR LAWS.

SÉTUBAL, called by the English St. Ubes, a port and commercial town in the province of Estremadura, Portugal, nearly twenty miles southeast of Lisbon, lining for about three-quarters of a mile the north shore of a harbor of the same name and an arsenal. Sétubal suffered severely, along with Lisbon, from the earthquake of 1755. The population was 14,798 in 1878.

SEVENOAKS, a market town of Kent, England, situated on high ground about a mile from the railway station, twenty-five miles southeast of London by the London, Chatham and Dover railway, and twenty by the Southeastern railway. The population of the urban sanitary district (area 2,028 acres) in 1871 was 4,118, and in 1881 it was 6,296.

SEVEN SLEEPERS OF EPHESUS, THE, according to the most common form of an old legend of Syrian origin, first referred to in Western literature by Gregory of Tours (*De Glor. Mart.*, c. 95), were seven Christian youths of Ephesus, who, to escape the rage of Decius, lived for some time in concealment in a cave. The enemy at last, however, discovered their hiding place, and caused great stones to be rolled to its mouth that they might die of hunger. The martyrs fell asleep in a mutual embrace. The occurrence had long been forgotten, when it fell out, in the thirtieth year of Theodosius II., 196 years afterward, that a certain inhabitant of Ephesus, seeking shelter for his cattle, rediscovered the cave on Mount Cœlian, and, letting in the light, awoke the inmates, who sent one of their number down to buy food. Cautiously approaching the city, the lad was greatly astonished to find the cross displayed over the gates, and on entering to hear the name of Christ openly pronounced. By tendering coin of the time of Decius at a baker's shop he roused suspicion, and in his confusion, being unable to explain how he had come by the money, he was taken before the authorities as a dishonest finder of hidden treasure. He was easily able to confirm the strange story he now had to tell by actually leading his accusers to the cavern where his six companions were found, youthful and rosy and beaming with a holy radiance. Theodosius, hearing what had happened, hastened to the spot in time to hear from their lips that God had wrought this wonder to confirm his faith in the resurrection of the dead. This message once delivered, they again fell asleep.

SEVERN, THE, next to the Thames in length among the rivers of England, rises at Maes Hafren on the eastern side of Plinlimmon, on the south-southwest borders of Montgomeryshire, and flows in a nearly semicircular course of about 200 miles to the sea; the direct distance from its source to its mouth in the Bristol Channel is about 80 miles.

SEVERN, JOSEPH, English portrait and subject painter, was born in 1793. In 1820 he gained the gold medal and a three years' traveling studentship for his *Una and the Red Cross Knight in the Cave of Despair*, a painting now in the possession of the representatives of the late Lord Houghton. He accompanied his friend Keats the poet to Italy, and nursed him until his death in 1821. In 1861 he was appointed British consul at Rome, a post which he held till 1872, and during a great part of the time he also acted as Italian consul. His most remarkable work is the *Spectre Ship* from the *Ancient Mariner*. He died at Rome August 3, 1879.

SEVERUS, LUCIUS SEPTIMUS, the twenty-first emperor of Rome, reigned from 193 to 211 A. D. He was born in 146 at Leptis Magna, an African coast town in the district of Syrtes. In 178 Severus became prætor, not by favor of the emperor, but by competition for the suffrages of the senators. Then, probably in the same year, he went to Spain as legate; after that (179) he commanded a legion in Syria. The death of Marcus Aurelius seems in some way to have interrupted his career; he was unemployed for several years, and devoted great part of his leisure to the study of literature, religion, and antiquities (so says Spartianus) at Athens. The year of Severus' first consulship cannot be determined with precision, but it falls within the space between 185 and 190. In this time also falls the marriage with Julia, afterward famous as Julia Domna, whose acquaintance he had no doubt made when an officer in Syria. Her two sons Bassianus (known as Caracalla) and Geta were probably born in 188 and 189. Severus was governor in succession of Gallia Lugdunensis, Sicily, and Pannonia Superior. He was in command of three legions at Carnuntum, the capital of the province last named, when news reached him that Commodus had been murdered by his favorite concubine and his most trusted servants.

Up to this moment the career of Severus had been ordinary in its character. He had not raised himself above the usual official level. He had achieved no military distinction,—had indeed seen no warfare beyond the petty border frays of a frontier province. But the storm that now tried all official spirits found his alone powerful enough to brave it. Three imperial dynasties had now been ended by assassination. The Flavian line had enjoyed much shorter duration and much less prestige than the other two, and the circumstances of its fall had been peculiar in that it was probably planned in the interest of the senate and the senate certainly reaped the immediate fruits. But the crisis which arose on the death of Nero and the crisis which arose on the death of Commodus were strikingly alike. In both cases it was left to the army to determine by a struggle which of the divisional commanders should succeed to the command-in-chief, that is, to the imperial throne. In each case the contest began with an impulsion given to the commanders by the legionaries themselves. The soldiers of the great commands competed keenly for the honor and the material advantages to be won by placing their general in the seat of empire. The officer who refused to lead would have been deemed a traitor to his troops, and would have suffered the punishment of his treason.

There is a widespread impression that the Prætorian guards at all times held the Roman empire in their hands, but its erroneousness is demonstrated by the events of the year 193. For the first time in the course of imperial history the Prætorians presumed to nominate as emperor a man who had no legions at his back. This was Pertinax, who has been well styled the Galba of his time—upright and honorable to severity, and zealous for good government, but blindly optimist about the possibilities of reform in a feeble and corrupt age. After a three months' rule he was destroyed by the power that lifted him up. According to the well-known story, true rather in its outline than in its details, the Prætorians sold the throne to Didius Julianus. But at the end of two months both the Prætorians and their nominee were swept away by the real disposers of Roman rule, the provincial legions. Four groups of legions at the time were strong enough to aspire to determine the destiny of the empire—those quartered in Britain, in Germany, in Pannonia, in Syria. Three of the groups actually took the decisive step, and Severus in Pannonia, Pescennius Niger in Syria, Clodius Albinus in Britain, received from their troops the title of Augustus. Severus far outdid his rivals in promptness and decision. By what means we do not know, he secured the aid of the legions in Germany and those in Illyria. These, with the forces in Pannonia, made a combination sufficiently formidable to overawe Albinus for the moment. He probably deemed that his best chance lay in the exhaustion of his competitors by an internecine struggle. At all events he received with submission an offer made by Severus, no doubt well understood by both to be politic, insincere, and temporary. Severus sent a trusted officer, who confirmed Albinus in his power and bestowed upon him the title of Cæsar, making him the nominal heir-apparent to the throne.

Before the action of Severus was known in Rome, the senate and people had shown signs of turning to Pescennius Niger, that he might deliver them from the poor puppet Didius Julianus and avenge on the Prætorians the murder of Pertinax. Having secured the coöperation or neutrality of all the forces in the western part of the empire, Severus hastened to Rome. To win the sympathy of the capital he posed as the avenger and successor of Pertinax, whose name he even added to his own, and used to the end of his reign. The feeble defenses of Julianus were broken down and the Prætorians disarmed and disbanded, without a blow being struck. A new body of household troops was enrolled and organized on quite different principles from the old. In face of the senate, as Dio tells us, Severus acted for the moment like "one of the good emperors in the olden days." After a magnificent entry into the city he joined the senate in execrating the memory of Commodus, and in punishing the murderers of Pertinax, while he honored the latter with splendid funeral rites. He also encouraged the senate to pass a decree directing that any emperor or subordinate of an emperor who should put a senator to death should be treated as a public enemy. But he ominously refrained from asking the senate to sanction his accession to the throne.

The rest of Severus' reign, as it is read in the ancient histories, is in the main occupied with wars, over which we shall rapidly pass. Late in 196 Severus turned westward, to reckon with Albinus, who was well aware that the reckoning was inevitable. He was better born and better educated than Severus, but in capacity far inferior. As Severus was nearing Italy he received the news that Albinus had been declared emperor by his soldiers. The first counter-stroke of Severus was to affiliate himself and his elder son to the Antonines by a sort of spurious and posthumous adoption.

The collision between the forces of Severus and Albinus was the most violent that had taken place between Roman troops since the mighty contest at Philippi. The decisive engagement was fought in February of the year 197 on the plain between the Rhone and the Saône, to the north of Lyons. Dio tells us that 150,000 men fought on each side. The fortunes of Severus were, to all appearance, at one stage of the battle as hopeless as those of Julius Cæsar were for some hours during the battle of Munda. The tide was turned by the same means in both cases—by the personal conduct and bravery of the commander.

By this crowning victory Severus was released from all need for disguise, and "poured forth on the civil population all the wrath which he had been storing up for a long time."

The next years (197–202) were devoted by Severus to one of the dominant ideas of the empire from its earliest days—war against the Parthians. The results to which Trajan and Verus had aspired were now fully attained, and Mesopotamia was definitely established as a Roman province. Part of the time was spent in the exploration of Egypt, in respect of which Dio takes opportunity to say that Severus was not the man to leave anything human or divine uninvestigated. The emperor returned to enjoy a well-earned triumph, commemorated to this day by the arch in Rome which bears his name. During the six years which followed (202–208) Severus resided at Rome and gave his attention to the organization of the empire.

Severus spent the last three years of his life (208–211) in Britain, amid constant and not very successful warfare, which he is said to have provoked partly to strengthen the discipline and powers of the legions, partly to wean his sons from their evil courses by hard military service. He died at York, England, in February of the year 211. There are vague traditions that his death was in some way hastened by Caracalla. This prince had been, since about 197, nominally joint emperor with his father, so that no ceremony was needed for his recognition as monarch.

SEVERUS, Marcus Aurelius Alexander, Roman emperor from 222 to 235, was of Syrian parentage, and was born at Arca near the Syrian Tripolis, probably in the year 205. His original name was Alexius Bassianus, but he changed it in 221, when Mæsa persuaded Elagabalus to adopt his cousin as successor and create him Cæsar. In the next year Elagabalus was murdered, and Alexander was proclaimed by the Prætorians and accepted by the senate. Mutinies became frequent in all parts of the empire: to one of them the life of the prætorian præfect Ulpian was sacrificed; another compelled the retirement of Dion Cassius from his command. On the whole, however, the reign of Alexander Severus was prosperous till he was summoned to the East to face the new power of the Sàsànians. Of the war that followed we have various accounts; Mommsen leans to that which is least favorable to the Romans. At all events, though the Persians were checked for the time, the conduct of the Roman army showed an extraordinary lack of discipline. The emperor returned to Rome and celebrated a triumph (233), but next year he was called to face German invaders in Gaul, and there was slain with his mother in a mutiny.

SEVERUS, Sulpicius, early Christian writer, was born about 365 A.D. A native of Aquitania, he was thoroughly imbued with the culture of his country and time. Almost all that we know of his life comes from a few allusions in his own writings, and some passages in the letters of his friend Paulinus, bishop of Nōla. In his early days he was famous as a pleader in the courts, and his knowledge of Roman law is reflected in parts of his writings. He married a wealthy lady belonging to a consular family, who died young, leaving him no children. At this time Severus came under the powerful influence of St. Martin, bishop of Tours, by whom he was led to devote his wealth to the Christian poor, and his own powers to a life of good works and meditation. He rose to no higher rank in the church than that of presbyter. His time was passed chiefly in the neighborhood of Toulouse, and such literary efforts as he permitted to himself were made in the interests of Christianity. He died about 425.

SÉVIGNÉ, Marie de Rabutin-Chantal, Marquise de, the most charming of all letter-writers in all languages, was born at Paris on February 6, 1626, and died at the chateau of Grignan (Drôme), on April 18, 1696. She married Henri, Marquis de Sévigné, a Breton gentleman of a good family, and allied to the oldest houses of that province, but of no great estate. The marriage took place on August 4, 1644, and the pair went almost immediately to Sévigné's manor-house of Les Rochers, near Vitré, a place which Madame de Sévigné was in future years to immortalize. Very little good is said of Henri de Sévigné by any of his contemporaries. At last Sévigné's pleasant vices came home to him. He quarreled with the Chevalier d'Albret about Madame de Gondran, fought with him and was mortally wounded on February 4, 1651; he died two days afterward. To close this part of the subject it may be said that though only six and twenty, and more beautiful than ever, Marie never married again, despite frequent offers, and that no aspersion was ever thrown, save in one instance, on her fame. For the rest of her life, which was long, she gave herself up to her children.

After her husband's death, Madame de Sévigné passed the greater part of the year 1651 in retirement at Les Rochers. She had, however, no intention of renouncing the world; and she returned to Paris in November of that year, her affairs having been put in such order as Sévigné's extravagance permitted by the faithful Coulanges. For nearly ten years little of importance occurred in her life, which was passed at Paris.

During these earlier years, Madame de Sévigné conceived, like most of the better and more thoughtful among Frenchmen and Frenchwomen, a great affection for the establishment of Port Royal, which was not without its effect on her literary work. That work, however (if writing, than which certainly none was ever less carried out in a spirit of mere workmanship, can be so called), dates in its bulk and really important part almost entirely from the last thirty years of her life. Her letters before the marriage of her daughter, though by themselves they would suffice to give her a very high rank among letter-writers, would not do more than fill one moderate-sized volume. Those after that marriage fill nearly ten large volumes in the latest and best edition. Her daughter became Madame de Gregnan in 1669.

In 1671 Madame de Sévigné, with her son, paid a visit to Les Rochers, which is memorable in her history and in literature. The states of Brittany were convoked that year at Vitré. This town being in the immediate neighborhood of Les Rochers, Madame de Sévigné's usually quiet life at her country house was diversified by the necessity of entertaining the governor, the Duc de Chaulnes, of appearing at his receptions, and so forth. All these matters are duly consigned to record in her letters, together with much good-natured raillery (it must be admitted that this is sometimes almost on the verge of being ill-natured, though never quite over it) on the country ladies of the neighborhood and their ways. She remained at Les Rochers during the whole summer and autumn of 1671, and did not return to Paris until late in November. The country news is then succeeded by news of the court.

The year 1676 saw several things important in Madame de Sévigné's life. For the first time she was seriously ill—it would appear with rheumatic fever—and she did not thoroughly recover till she had visited Vichy. Her letters from this place are among her very best, and picture life at a seventeenth century watering-place with unsurpassed vividness. In this year, too, took place the trial and execution of Madame de Brinvilliers. This event figures in the letters, and the references to it are among those which have given occasion to unfavorable comments on Madame de Sévigné's character — comments unjustified by the facts and long since discredited. In the next year, 1677, she moved into the Hôtel Carnavalet, a house which still remains and is inseparably connected with her memory. In 1680 she again visited Brittany, but the close of that year saw her back in Paris to receive another and even longer visit from her daughter, who remained in Paris for four years. Before the end of the last year of this stay (in February, 1684), Charles de Sévigné, after all his wandering loves, and after more than one talked-of alliance, was married to a young Breton lady, Jeanne Marguerite de Mauron, who had a considerable fortune. Madame de Grignan still continued with only short absences to inhabit Paris, and the mother and daughter were practically in each other's company until 1688. The proportion of letters therefore that we have for the decade 1677–1687 is much smaller than that which represents the decade preceding it; indeed the earlier period contains the great bulk of the whole correspondence. 1691 was passed at Grignan and other places in the south, but at the end of it Madame de Sévigné returned to Paris, bringing the Grignans with her; and her daughter stayed with her till 1694. The year 1693 saw the loss of two of her oldest friends—Bussy Rabutin, her faithless and troublesome but in his own way affectionate cousin, and Madame de la Fayette, her life-long companion, and on the whole perhaps her best and wisest friend. Another friend almost as intimate, Madame de Lavardin, followed in 1694. Madame de Sévigné spent but a few months of this latter year alone, and followed her daughter to Provence. She never revisited Brittany after 1691. Two important marriages with their preparations occupied most of her thoughts during 1694–1695. The young Marquis de Grignan married the daughter of Saint-Amant, an immensely rich financier; but his mother's pride, ill-nature, and bad taste (she is said to have remarked in full court that it was necessary now and then to "manure the best lands," referring to Saint-Amant's wealth, low birth, and the Grignan's nobility) made the marriage not a very happy one. Her sister Pauline, who, in the impossibility of dowering her richly, had a narrow escape of the cloister, made a marriage of affection with M. de Simiane, and eventually became the sole representative and continuator of the families of Grignan and Sévigné.

Madame de Sévigné survived these alliances but a very short time. During an illness of her daughter she herself was attacked by smallpox in April, 1696, and she died on the 17th of that month at Grignan, and was buried there.

SEVILLE, a Spanish province—one of the eight into which Andalusia is divided—and formerly one of the four Moorish kingdoms, is bounded on the south by Malaga and Cadiz, on the west by Huelva, on the north by Badajoz, and on the east by Cordova. The superficial area is 5,429 square miles, and in 1889 the population numbered 515,291. The province is one of the most productive and flourishing in Spain, and grows all kinds of grain and vegetables. Oil and wine, oranges and olives, are among its chief exports, while tobacco, leather, paper, spirits, chocolate, textile fabrics of silk and wool, soap, glass, and earthenware are among its manufactures. Sheep and oxen, horses and asses, are reared on its pastures; and in the mountainous districts there are copper, silver, lead, iron, coal, and salt mines, and quarries of chalk and marble. Commerce has made great strides of late years.

SEVILLE (Span. *Sevilla*, Latin *Ispalis*, Arabic *Ishbiliya*), capital of the above province and the seat of an archbishopric, with a population of 143,938 in 1889, is situated in 37° 22′ N. latitude and 5° 58′ W. longitude, 62 miles (95 by rail) north-northeast of Cadiz and 355 miles south-southwest of Madrid, on the left bank of the Guadalquivir. The aspect of the town is essentially Moorish, with its narrow tortuous streets and fine inner court-yards to the houses. Many of these date from before the Christian conquest, and the walls and towers which until recently encircled the city for a length of five miles have a similar origin. The victory of Ferdinand brought temporary ruin on the city, for it is said that 400,000 of the inhabitants went into voluntary exile, and some time elapsed before Seville recovered from the loss. But its position was too favorable for trade for it to fall into permanent decay, and by the fifteenth century it was again in a position to derive full benefit from the discovery of America. After the reign of Philip II. its prosperity gradually waned with that of the rest of the Peninsula; yet even in 1700 its silk factories gave employment to thousands of workpeople; their numbers, however, by the end of the eighteenth century, had fallen to 400. In 1800 an outbreak of yellow fever carried off 30,000 of the inhabitants, and in 1810 the city suffered severely from the French under Soult, who plundered to the extent of $30,000,000. Since that time it has gradually recovered prosperity, and is now one of the most busy and active centers of trade in the peninsula. Politically Seville has always had the reputation of peculiar loyalty to the throne from the time when, on the death of Ferdinand III., it was the only city which remained faithful to his son Alphonso the Wise. It was consequently much favored by the monarchs, and frequently a seat of the court. In 1729 the treaty between England, France, and Spain was signed in the city; in 1808 the central junta was formed here and removed in 1810 to Cadiz; in 1823 the cortes brought the king with them from Madrid; and in 1848 Seville combined with Malaga and Granada against Espartero, who bombarded the city, but fled on the return of Queen Maria Christina to Madrid.

SÈVRES, a town of France, in the department of Seine-et-Oise, on the left bank of the Seine, midway between Paris and Versailles, with a population of 6,768 in 1881, owes its celebrity to the government porcelain manufactory, which dates from 1756. A technical school of mosaic was established at Sèvres in 1875.

SÈVRES, Deux, a department of western France, formed in 1790 mainly of the districts of Thouars, Gâtinais, and Niortais, which constituted about one-fourth of Poitou, and to a small extent of a portion of Basse-Saintonge and Angoumois, and a very small fragment of Aunis. It derives its name from the Sèvre of Niort, which flows across the south of the department from east to west, and the Sèvre of Nantes, which drains the northwest. Lying between 45° 58′ and 47° 7′ N. latitude and between 0° 56′ W. and 0° 13′ E. longitude, it is bounded (for the most part conventionally) north by Maine-et-Loire, east by Vienne, southeast by Charente, south by Lower Charente, and west by La Vendée. Population (1889), 365,913.

SEWAGE. See Sewerage.

SEWARD, William Henry, American statesman, was born May 16, 1801, in the town of Florida, Orange county, N. Y. He was graduated at Union College in 1820, and began the practice of law three years after in the town of Auburn, which became his home for the rest of his life. Several of his cases brought him reputation as a lawyer, but he soon drifted into the more congenial field of politics. After he had served for four years in the State senate, the Whig party of New York nominated him for governor of the State in 1834. Though then defeated, he was nominated again in 1838 and elected, serving until 1842. He then returned to his law practice, retaining, however, the recognized leadership of the Whig party in the most important State of the Union. During the next seven years slavery became the burning question of American politics. The purely ethical and the philanthropic sides of the anti-slavery struggle are represented by Garrison and Greeley, (*q.v.*) Seward was the first to develop that purely political side, with an economic basis, which probably best met the desires and prejudices of the great mass of those who took part, willing or unwilling, in the struggle. The keynote of his theory was struck in 1848 in a speech at Cleveland—"The party of slavery upholds an aristocracy, *founded on the humiliation of labor* as necessary to the existence of a chivalrous republic." His theory culminated naturally in his famous Rochester speech of 1858, in which he enumerated the inevitable direct and indirect consequences of a free-labor and a slave-labor system respectively, showed the two to be absolutely irreconcilable and yet steadily increasing their interferences with one another, and drew this pregnant inference—there is here "an irrepressible conflict between opposing and enduring forces, and it means that the United States must and will, sooner or later, become either entirely a slave-holding nation or entirely a free-labor nation." But the germ of the "irrepressible conflict" of 1858 lay clearly in the utterances of 1848, and Seward was even then most widely known as its exponent. When, therefore, the New York Whigs, who, in 1849, controlled the State legislature, which elects United States senators, sent Seward to the senate with hardly a show of opposition, their defiance of the southern wing of their party was a premonition of the general break-up of parties three years afterward. In the senate Seward had at first but two pronounced anti-slavery associates. As anti-slavery feeling increased, and the Republican party was organized in 1855–56, he went into it naturally, for it was to him only an anti-slavery Whig party, and his pre-eminent ability made him at once its recognized leader. In the Republican convention of 1860 he was the leading candidate for the nomination for president; and it was only by a sudden union of all the elements of opposition to him that the nomination was finally given to Abraham Lincoln, whose name was then hardly known outside of Illinois. It has been an almost invariable rule that American presidents have found their most irritating difficulties in dealing with the New York leaders of their respective parties; Lincoln, when elected, removed any such possibility by offering Seward the chief position in his cabinet, that of secretary of state. Here, for at least four years, Seward did the great work of his life. Mr. Seward ranked with Lincoln and Stanton as the representative of Union sentiment throughout the Civil War. Early in that great struggle he hoped that peace might prevail and he counseled moderate measures. He would have evacuated Fort Sumter, but only for strategic reasons, and at the same time he would have maintained the rights of the United States elsewhere. He defended the action of Commodore Wilkes in taking the Confederate commissioners, Mason and Slidell, from the British mail-steamer *Trent* but he did so because he claimed that the seizure was in accordance with the British assertion of "the right of search." If therefore the British Government abandoned that claim he was willing to give the men up, for that implied the acknowledgment of what we fought for in 1812–14. Mr. Seward, in dealing with the affairs of Mexico, firmly maintained the Monroe doctrine; and insisted on the right of American citizens to claim damages from Great Britain for the depredations of the *Alabama*.

On the evening of April 14, 1865, when Lincoln was assassinated, one of Booth's confederates, a man named Payne, entered the bedroom of Secretary Seward, who was suffering from the effects of an accident, and inflicted several wounds upon him with a dagger. Mr. Seward's recovery was very slow, but he resumed his duties. He negotiated the purchase of Alaska from Russia in 1867. Then followed the attempt to impeach President Johnson, which Seward opposed. (See Johnson, Andrew, and Reconstruction, *ante.*) In March, 1869, Mr. Seward retired from office, and a year later he made a tour of the world. No American citizen was ever received with greater honors by foreign princes and people until the great general of the Rebellion made his famous journey a few years later. Mr. Seward died at Auburn, N. Y., while preparing a history of his journey, October 10, 1872. The narrative of his "Travels around the World" was edited and published by his adopted daughter in 1873, and an edition of his "Works" has also been issued. His "Biography," which extends only to 1834, was continued by his son. Charles Francis Adams also published an "Address on the Life, Character and Services of Seward," which elicited a reply from Gideon Welles. Of Seward's family, AUGUSTUS HENRY, born in 1826, served in the Mexican War and the war of the Rebellion. FREDERICK WILLIAM, born in 1830, was assistant Secretary of State 1861–69, and again from 1877 to 1881. Another son, WILLIAM HENRY, fought in the Civil War, and rose to be brigadier-general of volunteers.

SEWERAGE is the process of systematically collecting and removing refuse from dwellings. The matter to be dealt with may conveniently be classified as made up of four parts: (1) dust, ashes, kitchen waste, and solid matters generally, other than solid excreta, (2) excreta, consisting of urine and feces; (3) slop-water, or the discharge from sinks, basins, baths, etc., and the waste water of industrial processes; (4) surface water due to rainfall. Before the use of underground conduits became general, the third and fourth constituents were commonly allowed to sink into the neighboring ground, or to find their way by surface channels to a watercourse or to the sea. The first and second constituents were conserved in middens or pits, either together or separately, and were carried away from time to time to be applied as manure to the land. In more modern times the pits in which excrement was collected took the form of covered tanks called cesspools, and with this modification the primitive system of conservancy, with occasional removal by carts, is still to be found in many towns. Even where the plan of removing excrement by sewers has been adopted, the first kind of refuse named above is still treated by collecting it in pails or bins, whose contents are removed by carts either daily or at longer intervals. It therefore forms no part of the nearly liquid sewage which the other constituents unite to form.

The second constituent is from an agricultural point of view the most valuable, and from a hygienic point of view the most dangerous, element of sewage. Even healthy excreta decompose, if kept for a short time after they are produced, and give rise to noxious gases; but a more serious danger proceeds from the fact that in certain cases of sickness these products are charged with specific germs of disease. Speedy removal or destruction of excremental sewage is therefore imperative. It may be removed in an unmixed state, either in pails or tanks or (with the aid of pneumatic pressure) by pipes; or it may be defecated by mixture with dry earth or ashes; or, finally, it may be conveyed away in sewers by gravitation, after the addition of a relatively large volume of water. This last mode of disposal is termed the water-carriage system of sewerage. It is the plan now usually adopted in towns which have a sufficient water supply, and it is probably the mode which best meets the needs of any large community. The sewers which carry the diluted excreta serve also to take slop-water, and may or may not be used to remove the surface water due to rainfall. The water-carriage system has the disadvantage that much of the agricultural value of sewage is lost by its dilution, while the volume of foul matter to be disposed of is greatly increased. But it has been found that, even when the excrement of a community is kept out of the sewers, and subjected to distinct treatment, the contents of the sewers are still so foul that their discharge into streams is scarcely less objectionable than when the water-carriage system is adopted; and, further, it appears difficult if not impossible to realize the agricultural value of excrement by any process of separate treatment that is not offensive or dangerous or inapplicable to towns.

When, in the water-carriage system, the same sewers carry foul sewage and surface-water due to rain-fall, the sewerage is said to be "combined"; the "separate" system, on the other hand, is that in which a distinct set of sewers is provided to carry off rainfall. Each plan has its advantages. In the separate system the foul-water sewers need be large enough to take only the normal flow; they may thus be made self-cleansing much more readily than if their size were sufficient to carry the immensely greater volume to which (on the combined plan) sewage may be swollen during the heavy rain. The amount of dangerously foul matter is also much reduced. On the other hand, the contents of the rain-water sewers are still too much tainted by the filth of the streets to render their discharge into rivers or lakes desirable; and the complication of two sets of mains and branches is a serious drawback. Where old sewers are giving place to new ones it is not unusual to retain the old sewers for the carriage of surface-water; but in new works a single system of sewers, provided with storm-overflows to relieve them of part of the rainfall during exceptionally heavy showers, would probably be preferred in nearly every case. Since sewers should, in all cases, be water-tight, they do not form suitable collectors of subsoil water.

The water-carriage system of sewerage will be noticed here under its three aspects:—(1) the ultimate disposal of sewage; (2) the system of common sewers by which sewage is conveyed to its destination; (3) the domestic arrangements for the collection of sewage.

I. THE ULTIMATE DISPOSAL OF WATER-CARRIED SEWAGE.—In the water-carriage system of sewerage the fertilizing elements are so largely diluted that it becomes a matter of the utmost difficulty to turn them to profitable account. It has been estimated that every ton of London sewage contains ingredients whose value as manure is rather more than 4 cts., a value which, could it be realized, would make the sewage of the metropolis worth $8,750,000 per annum. Sewage farming, however, does not pay. After much costly experiment the conviction is gaining ground that, neither by applying sewage directly to land, nor by any process of chemical treatment that has yet been proposed, can sewage be made to yield a return as manure which will cover the cost of its transport, treatment, and distribution, except perhaps in a few cases where the circumstances are peculiarly favorable. At the same time, sewage farming does afford one satisfactory solution of the problem of how to dispose of sewage without creating a nuisance —a problem in which any question of profit or loss is of secondary importance. A very early instance of irrigation by sewage is that of the Craigentinny Meadows, a sandy tract of 400 acres, on which part of the sewage of Edinburgh has been discharged during certain seasons for nearly a century. There, owing to favorable conditions, and to the fact that complete purification of the sewage is not attempted, the process yields a profit; but no such result could be looked for if the sea were not at hand to receive the imperfectly cleansed sewage and the wholly uncleansed surplus. Germany furnishes a still older example of irrigation in the sewage farm of the town of Bunzlau, which has been in existence for more than 300 years.

Five methods of treating sewage may be named, of which two or more are often found in combination.

Discharge into the Sea or into a large watercourse is in general the least costly means by which a community can rid itself of its sewage. Much care in the choice of outlets is necessary to make this plan effective in avoiding nuisance. Some towns make use of tanks or outlet sewers of large capacity, from which the discharge is allowed to occur only when the tide is ebbing. When the volume of sewage is very large, even this precaution does not wholly protect the neighboring coast from foul deposits. A striking instance is furnished by the case of London, which discharges its sewage into the tidal estuary of the Thames at Barking and Crossness during only some three or four hours from the time of each high tide. It is found that the discharged matter is washed up and down the river with every tide, occasionally reaching as far up as Teddington, and that the portion which is not deposited in the form of mud banks only very slowly works its way to the sea.

Broad Irrigation.—By this is meant the use of sewage to irrigate a comparatively large tract of cultivated land, in the proportion of about one acre (or more) of land to every 120 persons in the sewage-contributing population. This system is now largely and successfully used, especially where the soil is a porous sandy loam. Fears that the farms would prove dangerous to the health of the neighboring district, and that the crops and vegetables grown on them would be unwholesome, have proved groundless. When the farm is properly laid out and carefully managed the affluent water is pure enough to be admitted to a clear stream from which water-supply is drawn. Broad irrigation is practiced at Croydon, Cheltenham, Blackburn, and many other English towns; and it has recently been applied, on a very large scale, to dispose of the sewage of Berlin.

Intermittent Downward Filtration.—This is another mode of purifying sewage by applying it to land, which differs from broad irrigation in requiring a much smaller area in proportion to the sewage dealt with. In 1870 Dr. Frankland drew attention to the fact that if sewage were passed through porous soil, not continuously but at intervals long enough to let the soil become aerated, rapid purification took place through the oxidizing action of the air which the soil held in its pores. He estimated that an acre of suitable ground, well furnished with subsoil drains to remove the water after percolation, could in this way take the sewage of 2,000 persons. This estimate is now considered excessive, and 1,000 persons to the acre is a more recent limit.

Filtration through Artificial Filters of sand, gravel, ashes, charcoal, coke, peat, etc., though often experimented on, can scarcely be described as an actual system. It is attended by the difficulty that the filter becomes speedily choked by the deposit of sludge. The intermittent use of a suitable artificial filter will, however, serve efficiently to oxidize and therefore purify the liquid portion of sewage from which the sludge has been previously precipitated, and filtration through coke is used in some instances as a supplement to the process which is next to be described.

Chemical Treatment or Precipitation.—When sewage is allowed to stand, or to flow very slowly through a large tank, a gradual subsidence of the solid particles takes place. The subsidence is, however, much too slow to be complete before decomposition sets in. But it may be very greatly accelerated by the addition of certain reagents, with the object of producing a precipitate which, in falling, will carry down with it the minute particles of solid matter that are suspended throughout the mass. Lime is the substance most usually employed. It is introduced in the form of milk of lime, and in the proportion of about one ton of lime to one million gallons of sewage. When thoroughly mixed, the liquid is left at rest, and a rapid separation of the sewage follows, into a comparatively clear supernatant liquid and a glutinous precipitate or "sludge." The sludge has little value as manure, for the best agricultural constituents of sewage are contained in solution, and very little of the soluble matter is carried down in the deposit. The sludge is dried by being strained over beds of slag, pressed into blocks for transport, and got rid of by being burnt or dug into the ground or thrown into the sea. It has been used in the manufacture of bricks and of cement (Scott's process), but in general it can be disposed of only at a loss. The clarified effluent still contains dissolved organic matter, and may be admitted into running streams only when a high standard of purity is not compulsory. When, however, the volume of the running water which it enters is relatively very large a quick purification takes place by means of the oxygen which the water carries in solution.

II. The Conveyance of Sewage.—For small sewers, circular pipes of glazed earthenware or fire-clay or of molded cement are used, from six inches to eighteen inches and even twenty inches in diameter. The pipes are made in short lengths, and are usually jointed by passing the end or spigot of one into the socket or faucet of the next. Into the space between the spigot and faucet a ring of gasket or tarred hemp should be forced, and the rest of the space filled up with cement, not clay. The gasket prevents the cement from entering the pipe, and so obstructing the flow; at the same time it forms an elastic packing which serves to keep the successive lengths of pipe concentric, even if the cement should fail. The pipes are laid with the spigot ends pointing in the direction of the flow, with a uniform gradient, and, where practicable, in straight lines. In special positions, such as under the bed of a stream, cast-iron pipes are used for the conveyance of sewage. Where the capacity of an eighteen-inch circular pipe would be insufficient, built sewers are used in place of earthenware pipes. These are sometimes circular or oval, but more commonly of an egg-shaped section, the invert or lower side of the sewer being a curve of shorter radius than the arch or upper side. The advantage of this form lies in the fact that great variations in the volume of flow must be expected, and the egg-section presents for the small or dry-weather flow a narrower channel than would be presented by a circular sewer of the same total capacity.

Built sewers are most commonly made of bricks, molded to suit the curved structure of which they are to form part. Separate invert blocks of glazed earthenware, terra-cotta, or fire-clay are often used in combination with brickwork. The bricks are laid over a templet made to the section of the sewer, and are grouted with cement. Concrete is now very largely used in the construction of sewers, either in combination with brickwork or alone. For this purpose the concrete consists of from five to seven parts of sand and gravel or broken stone to one of Portland cement. It may be used as a cradle for or as a backing to a brick ring, or as the sole material of construction by running it into position round a mold which is removed when the concrete is sufficiently set, the inner surface of the sewer being in this case coated with a thin layer of cement.

III. Domestic Sewerage.—In the water-carriage system each house has its own network of drain-pipes, soil-pipes, and waste-pipes, which lead from the basins, sinks, closets, and gullies within and about the house to the common sewer. These must be planned to remove sewage from the house and its precincts quickly and without leakage or deposit by the way; the air within them must be kept out of the dwelling, by placing a water trap at every opening through which sewage is to enter the pipes, and by making all internal pipes gas-tight; the pipes must be freely ventilated by a current of fresh air, in order to oxidize any deposited filth and to dilute any noxious gas they may contain; finally—and this is of prime importance—the air of the common sewer must be rigorously shut out from all drains and pipes within the house. To disconnect the pipes of each individual house from the atmosphere of the common sewer is the first principle of sound domestic sanitation. When this is done the house is safe from contagion from without, so far as contagion can come through sewer gas; and, however faulty in other respects the internal fittings may be, the house can suffer no other risk than that which arises from its own sewage.

Protection against the passage of gas through openings which admit of the entry of water is secured by the familiar device known as the water-trap.

The simplest and in many respects the best form of trap is a bent pipe or inverted siphon, which is sealed by water lying in the bend. The amount of the seal varies in practice from about ½ an inch to 3 inches. If the pressure of air within the pipe, below the trap, is greater than that of the air above the trap by an amount exceeding the pressure due to a column of water equal in height to the seal, the trap will be forced and air will bubble through. This is one way in which a trap may fail, but this may be prevented by sufficient ventilation of the pipe below the trap. Other possibilities of failure are, however, only too numerous. If the pipe is disused for some time, the water may evaporate so considerably as to break the seal. The pipe, if of lead, may bend out of shape, or it may even be so badly set in the first instance as to make the trap inoperative. The seal may be broken by the capillary action of a thread or strip of cloth, hanging over the lip of the trap and causing the water to drain away. A rush of water down the pipe, suddenly arrested, may pass the trap with such momentum as to leave it wholly or partly empty.

As regards house-drainage generally, the points of chief importance may be briefly summed up as follows: (1) the use of one or more disconnecting traps to shut off sewer gas from the whole system of house-drains and pipes; (2) the thorough ventilation of house-drains, soil-pipes, and branches, by providing openings through which air can enter at the foot and escape at the top; (3) the discharge of all sinks, basins, etc., other than water-closet fittings, and especially of fixed bedroom basins, into open traps in the open air; (4) the direct discharge of cistern overflows and safe-trays into the open air; (5) the use of cleanly and well-designed closets, basins, etc., each sealed by an ordinary bent trap; (6) the use of separate service cisterns for water-closets.

SEWIN, an English name for Salmon.

SEWING MACHINES. The sewing machine, as is the case with most mechanical inventions, is the result of the efforts of many ingenious persons, although it would appear that the most meritorious of these worked in entire ignorance of the labors and successes of others in the same field. Many of the early attempts to sew by machinery went on the lines of imitating ordinary hand-sewing, and all such inventions proved conspicuous failures. The method of hand-sewing is of necessity slow and intermittent, seeing that only a definite length of thread is used, which passes its full extent through the cloth at every stitch, thus causing the working arm, human or otherwise, to travel a great length for every stitch made, and demanding frequent renewals of thread. The foundation of machine-sewing was laid by the invention of a double-pointed needle, with the eye in the center, patented by Charles F. Weisenthal in 1755. This device was intended to obviate the necessity for inverting the needle in sewing or embroidering, and it was subsequently utilized in Heilman's well-known embroidery machine.

The inventor who first devised a real working machine was a poor tailor, Barthélemy Thimonier, of St. Étienne, who obtained letters patent in France in 1830. In Thimonier's apparatus the needle was crocheted, and descending through the cloth it brought up with it a loop of thread which it carried through the previously made loop, and thus it formed a chain on the upper surface of the fabric. The machine was a rather clumsy affair, made principally of wood, notwithstanding which as many as eighty were being worked in Paris in 1841, making army clothing, when an ignorant and furious crowd wrecked the establishment and nearly murdered the unfortunate inventor. Thimonier, however, was not discouraged, for in 1845 he twice patented improvements on it, and in 1848 he obtained both in France and the United Kingdom patents for further improvements. The machine was then made entirely of metal, and vastly improved on the first model. But the troubles of 1848 blasted the prospects of the resolute inventor. His patent rights for Great Britain were sold; a machine shown in the Great Exhibition of 1851 attracted no attention, and Thimonier died in 1857 unfriended and unrewarded.

The most important ideas of an eye-pointed needle and a double thread or lock-stitch are strictly of American origin, and that combination was first conceived by Walter Hunt of New York about 1832–34. Hunt reaped nothing of the enormous pecuniary reward which has been shared among the introducers of the sewing machine, and it is therefore all the more necessary that his great merit as an inventor should be insisted on.

Apparently quite unconscious of the invention of Walter Hunt, the attention of Elias Howe, a native of Spencer, Mass., was directed to machine sewing about the year 1843. In 1844 he completed a rough model, and in 1846 he patented his sewing machine. Howe was thus the first to patent a lock-stitch machine, but his invention had the two essential features—the curved eye-pointed needle and the underthread shuttle—which undoubtedly were invented by Walter Hunt twelve years previously. Howe's invention was sold in England to William Thomas, of Cheapside, London, a corset manufacturer, for £250 ($1,250). Thomas secured in December, 1846, the English patent in his own name, and engaged Howe on weekly wages to adapt the machine for his manufacturing purposes. The career of the inventor in London was checkered and unsuccessful; and, having pawned his American patent rights in England, he returned in April, 1849, in deep poverty to America. Here in the meantime the sewing machine was beginning to excite public curiosity, and various persons were making machines which Howe found to trench on his patent rights. The most prominent of the manufacturers, if not of inventors, ultimately appeared in the person of Isaac Merritt Singer, who in 1851 secured a patent for his machine and immediately devoted himself with immense energy to push the fortunes of the infant industry. Howe now became alert to vindicate his rights, and, after regaining possession of his pawned patent, he instituted suits against the infringers. An enormous amount of litigation ensued, in which Singer figured as a most obstinate defendant, but ultimately all makers became tributary to Elias Howe. It is calculated that Howe received in the form of royalties on machines made up to the period of the expiry of his extended patent—September, 1867—which was also the month of his death, a sum of not less than $2,000,000.

The practicability of machine-sewing being demonstrated, inventions of considerable originality and merit followed in quick succession. One of the most ingenious of all the inventors—who worked also without knowledge of previous efforts—was Mr. Allan B. Wilson. In 1849 he devised the rotary hook and bobbin combination, which now forms the special feature of the Wheeler and Wilson machine. Mr. Wilson obtained a patent for his machine, which included the important and effective four-motion feed, in November, 1850. In February, 1851, Mr. William O. Grover, tailor, of Boston, patented his double chain-stitch action, which formed the basis of the Grover and Baker machine. At a later date, in 1856, Mr. James A. E. Gibbs, a Virginia farmer, devised the improved chain-stitch machine, now popularly known as the Wilcox and Gibbs. These together—all American inventions—form the types of the various machines now in common use. Several thousands of patents have been issued in the United States and Europe, covering improvements in the sewing machine; but, although the efficiency of the machine has been greatly increased by numerous accessories and attachments, the main principles of the various machines have not been affected thereby.

SEX. Since the article REPRODUCTION (*q.v.*) includes not only some account of the reproductive processes but an outline of the comparative anatomy of the reproductive organs, and even a somewhat detailed description of the essential sexual elements, it only remains here to make a brief survey of the more important groups with respect to the absence, union, or distinction of the sexes and to the associated "secondary sexual characters" which distinctly male and female organisms so frequently and strikingly present, and to follow up that outline of the morphological facts with a brief discussion of the nature and origin of the sexes and of the theory of reproduction.

Characteristics of the Sexes.—Starting with the *Protozoa*, we find indeed that union or conjugation of two or more individuals is of frequent if not universal occurrence; yet, since, at any rate with rare and slight exceptions, no permanent morphological difference can be made out which would entitle us to speak of males or females, the group is generally defined as characterized by the absence of sexual reproduction.

Nature and Determination of Sex.—It is not here proposed to enter upon the task of historical review and criticism of the various theories of sex—which were estimated at so many as five hundred at the beginning of the last century, or even to attempt any sketch of the present very conflicting state of opinion on the subject.

Although our theories of sex may be still vague enough, the greatest step to the solution has been made in the general abandonment by scientific men of the doubtless still popular explanation—in terms of a "natural tendency" for the production of an excess of males or the like. It is now held that "quality and quantity of food, elevation of abode, conditions of temperature, relative age of parents, their mode of life, habits, rank, etc., are all factors which have to be considered." The idea that the problem of the nature of sex is capable of being approached by empirical observation of the numbers of different sexes produced under known sets of conditions, and the obvious practical corollary of this, viz., that the proportion of the sexes must therefore be capable of being experimentally modified and regulated, are conceptions which have steadily been acquiring prominence, especially of late. In short, if we can find how sex is determined, we shall have gone far to investigate sex itself.

Theory of Reproduction and Sex.—If we now attempt to reach a rational standpoint from which to criticise and compare the innumerable empirical conceptions of sex—much more if we seek a firm basis for the construction of a really comprehensive theory—it is evident that such a theory must be addressed not merely to the specialist concerned with problems of reproduction and development, but, while embracing details and anomalies, must be satisfactory alike to the general morphologist and physiologist.

Now, since every morphological and physiological fact or theory is in one or other of these categories, it is evident that we have here the required criterion of theories of reproduction and sex. The question, What is sex? what is meant by male or female? admits of a regular series of answers. The first and earliest is in terms of general aspect, temperament, and habit, and, though crude, empirical, and superficial, it lacks neither unity nor usefulness. At this plane are not only most popular conceptions but many theories like that of Starkweather, which may be mentioned as the most recent. The anatomist contents himself with the recognition of specific organs of sex, or at most with a similarly empirical account of their functions; while the embryologist and histologist will not rest contented without seeking to refer these organs to the tissues of which they are composed and the layer from which they spring, and even reaches and describes the ultimate cellular elements essential to sex—the ovum and spermatozoon. A parallel physiological interpretation of these is next required, and at this point appear such hypotheses as these of Weismann and others.

Thus the bewildering superabundance of widely different theories at the present juncture becomes intelligible enough; and, each once classified according to its stage of progress, a detailed criticism would be easy. But this is not enough: the demand for an explanation at once rational and ultimate, to comprehend and underlie all the preceding ones, is only the more urgent. Where shall we seek for it? On the one hand the morphological aspect of such an explanation must interpret the forms of sex cells in terms of those of cells in general, and in terms of the structural properties of protoplasm itself; while its more difficult yet more satisfying physiological aspect must express the mysterious difference of male and female in terms of the life processes of that protoplasm,—in terms, that is to say, of anabolism and katabolism. Were these steps made a new synthesis would be reached, and from this point it should even next be possible to retrace the progress of the science, and interpret the forms and the functions of tissues and organs, nay, even of the facts of aspect, habit, and temperament, so furnishing the deductive rationale of each hitherto merely empirical order of observed fact and connecting theoey.

SEXTANT, an instrument for measuring angles on the celestial sphere. The name (indicating that the instrument is furnished with a graduated arc equal to a sixth part of a circle) is now only used to designate an instrument employing reflection to measure an angle; but originally it was introduced by Tycho Brahe, who constructed several sextants with two sights, one on a fixed, the other on a movable radius, which the observer pointed to the two objects of which the angular distance was to be measured.

SEXTUS EMPIRICUS. See SKEPTICISM.

SEYCHELLES, an archipelago of the Indian Ocean, consisting of eighty islands—several of them mere islets—situated between 3° 38′ and 5° 45′ S. latitude and 52° 55′ and 53° 50′ E. longitude, about 1,400 miles southeast of Aden and 1,000 miles east of Zanzibar. Since 1881 the population has considerably increased in consequence of a tide of immigration from Mauritius. Men and women of exceptionally great age are frequently met with, and the death-rate for 1880 amounted to only 13.1 per 1,000. The prevailing language is a French patois, but English is taught in the schools.

These islands were discovered at the beginning of the sixteenth century, but never occupied, by the Portuguese. In 1742 the French took possession of them, calling them at first Îles des Labourdonnais, but afterward the Seychelles, from Count Hérault de Seychelles, an officer of the East Indian fleet. The first settlement was made in 1768 at Mahé, now Port Victoria. In 1794 the English wrested them from the French along with Mauritius, and they are now ruled by a board of six civil commissioners, as a dependency under the governor of Mauritius. In 1834 slavery was abolished, and since then the plantations have been in a declining state.

SEYMOUR, EDWARD. See SOMERSET, DUKE OF.

SEYNE, LA, a town of France, in the department of Var, five miles southwest of Toulon, with a population of 9,788 in 1881. It owes its importance mainly to its ship-building.

SEYMOUR, a prosperous city of Jackson county, Ind., sixty miles south of Indianapolis, fifty miles north of Louisville, and eighty-seven miles west of Cincinnati, at the intersection of the Ohio and Mississippi with the Jeffersonville, Madison and Indianapolis railroad. The city is prominent as the shipping and distributing point for a very large area of territory, and the annual business transacted represents large amounts in value. It is supplied with one weekly and two daily papers, contains two banks, a public school building that cost $30,000, ten churches, a large number of stores and many attractive public buildings and private residences. It is the location of an extensive woolen mill, also of saw and grist mills, a stave, hub and spoke factory, besides tanneries, etc., and the site of the machine-shops of the Ohio and Mississippi railroad, which gives employment to a large force of operatives. The present (1890) population of the city is 5,337.

SFAX, a city of Tunis, second in importance only to the capital, is situated 116 miles south of Mahadia, on the coast of the Gulf of Gabes (Syrtis Minor) opposite the Kerkenah Islands. In 1881 the population was said to be about 15,000 (including 1,200 Arabs, 1,500 Tunisian Jews, 1,000 Maltese, etc., 500 Europeans); in 1886 it is stated at 32,000 (1,200 Maltese, 1,000 Europeans).

SFORZA, HOUSE OF. See ITALY.

SHAD is the name given to certain migratory species of Herrings (*Clupea*), which are distinguished from the herrings proper by the total absence of teeth in the jaws. Two species occur in Europe, much resembling each other,—one commonly called Allis Shad (*Clupea alosa*), and the other known as Twaite Shad (*Clupea finta*). Both are, like the majority of herrings, greenish on the back and bright silvery on the sides, but they are distinguished from the other European species of *Clupea* by the presence of a large blackish blotch behind the gill-opening, which is succeeded by a series of several other similar spots along the middle of the side of the body.

On rivers in which these fishes make their periodical appearance they have become the object of a regular fishery, and their value increases in proportion to the distance from the sea at which they are caught. Thus they are much esteemed on the middle Rhine, where they are generally known as "Maifisch;" those caught on their return journey are worthless and uneatable. The allis shad is caught at a size from fifteen to twenty-four inches, and is considered to be better flavored than the twaite shad, which generally remains within smaller dimensions.

Other, but closely allied species, occur on the Atlantic coasts of North America, all surpassing the European species in importance as food-fishes and economic value, viz., the American Shad (*Clupea sapidissima*), the Gaspereau or Ale-wife (*C. mattowocca*), and the Menhaden (*C. menhaden*). (See MENHADEN.)

SHADDOCK (*Citrus decumana*) is a tree allied to the orange and the lemon, presumably native to the Malay and Polynesian islands, but generally cultivated throughout the tropics.

SHADWELL, THOMAS, a playwright and miscellaneous versifier of the Restoration period, Dryden's successor in the laureateship, is remembered now, not by his works, though he was a prolific writer of comedies highly successful in their day, but as the subject of Dryden's satirical portraits *MacFleknoe* and *Og*. He was born in 1640, and survived till 1692, and on Dryden's resignation of the laureateship in 1688, was promoted to the office.

SHAF'Í, SHAF'ÍTES. See SUNNITES.

SHAFTESBURY, ANTHONY ASHLEY COOPER, FIRST EARL OF, was the son of Sir John Cooper of Rockbourne in Hampshire, and of Anne, the only child of Sir Anthony Ashley, Bart., and was born at Wimborne St. Giles, Dorset, England, on July 22, 1621. In March, 1640, though still a minor, he was elected for Tewkesbury, and sat in the parliament which met on April 13th, but appears to have taken no active part in its proceedings. For the Long Parliament, which met on November 3, 1640, he was elected for Downton in Wiltshire, but the return was disputed, and he did not take his seat—his election not being declared valid until the last days of the Rump. In July, 1644, he went to Dorsetshire on military service, and on August 3d received a commission as field-marshal-general. He assisted at the taking of Wareham, and shortly afterward compounded for his estates by a fine of $2,500 from which, however, he was afterward relieved by Cromwell. He sat for Wiltshire in the Barebones parliament, of which he was a leading member, and where he zealously and prudently supported Cromwell's views against the extreme section. He was at once appointed on the council of thirty.

Cooper was again elected for Wiltshire for the parliament of 1656, but Cromwell refused to allow him, with many others of his opponents, to sit. He signed a letter of complaint, with sixty-five excluded members, to the speaker, as also a "Remonstrance" addressed to the people. In the parliament which met on January 20, 1658, he took his seat, and was active in opposition to the new constitution of the two Houses. He was also a leader of the opposition in Richard Cromwell's parliament, especially on the matter of the limitation of the power of the Protector, and against the House of Lords. He was throughout these debates celebrated for the "nervous and subtle oratory" which made him so formidable in after days: he had "his tongue well hung, and words at will."

Upon the replacing of the Rump by the army, after the breaking up of Richard's parliament, Cooper endeavored unsuccessfully to take his seat on the ground of his former disputed election for Downton. He was, however, elected on the council of state, and was the only Presbyterian in it; he was at once accused by Scot, along with Whitelocke, of corresponding with Hyde. This he solemnly denied. With Monk's commissioners he, with Haselrig, had a fruitless conference, but he assured Monk of his coöperation, and joined with eight others of the overthrown council of state in naming him commander-in-chief of the forces of England and Scotland. He was instrumental in securing the Tower for the Parliament, and in obtaining the adhesion of Admiral Lawson and the fleet. Upon the restoration of the Parliament on December 26th Cooper was one of the commissioners to command the army, and on January 2d was made one of the new council of state. On January 7th he took his seat on his election for Downton in 1640, and was made colonel of Fleetwood's regiment of horse. He now steadily pursued the design of the Restoration, but without holding any private correspondence with the king, and only on terms similar to those proposed in 1648 to Charles I. at the Isle of Wight. In the Convention Parliament he sat for Wiltshire. Monk cut short these deliberations and forced on the Restoration without condition. Cooper was one of the twelve commissioners who went to Charles at Breda to invite him to return. On his journey he was upset from his carriage, and the accident caused an internal abscess which was never cured.

Cooper was at once placed on the privy council, receiving also a formal pardon for former delinquencies. At the coronation in April, 1661, Cooper had been made a peer, as Baron Ashley of Wimborne St. Giles, in express recognition of his services at the Restoration; and on the meeting of the new parliament in May he was appointed chancellor of the exchequer and under-treasurer, aided no doubt by his connection with Southampton.

The new administration was headed by Buckingham, in whose toleration and comprehension principles Ashley shared to the full. A most able paper written by him to the king in support of these principles, on the ground especially of their advantage to trade, has been preserved. He excepts, however, from toleration Roman Catholics and Fifth Monarchy men. His attention to all trade questions was close and constant; he was a member of the council of trade and plantations appointed in 1670, and was its president from 1672 to 1676. The difficulty of the succession also occupied him, and he coöperated thus early in the design of legitimizing Monmouth as a rival to James. In the intrigues which led to the infamous treaty of Dover he had no part. That treaty contained a clause by which Charles was bound to declare himself a Catholic, and with the knowledge of this, Ashley, as a staunch Protestant, could not be trusted. In order to blind him and the other Protestant members of the Cabal a sham treaty was arranged in which this clause did not appear, and it was not until a considerable while afterward that he found out that he had been duped. Under this misunderstanding he signed the sham Dover treaty on December 31, 1670. This treaty, however, was carefully kept from public knowledge, and Ashley did not hesitate to help Charles to hoodwink parliament by signing a similar treaty on February 2, 1672, which was then laid before them as the only one in existence. This is one of the proved dishonorable actions of his life.

He was now rewarded by being made Earl of Shaftesbury and Baron Cooper of Pawlett by a patent dated April 23, 1672. It is stated, too, that he was offered, but refused, the lord treasurership. On November 17, 1672, however, he became lord chancellor, Bridgman having been compelled to resign the seat. As chancellor he issued writs for the election of thirty-six new members to fill vacancies caused during the long recess; this, though grounded upon precedent, was certainly open to the gravest suspicion as an attempt to fortify Charles, and was vehemently attacked by an angry House of Commons which met on February 4, 1673. The writs were canceled, and the principle was established that the issuing of writs rested with the House itself. It was at the opening of parliament that Shaftesbury made his celebrated "delenda est Carthago" speech against Holland, in which he urged the Second Dutch War, on the ground of the necessity of destroying so formidable a commercial rival to England, excused the Stop to the Exchequer which he had opposed, and vindicated the Declaration of Indulgence. On March 8th he announced to parliament that the declaration had been canceled, though he did his best to induce Charles to remain firm. For affixing the great seal to this declaration he was threatened with impeachment by the Commons. The Test Act was now brought forward, and Shaftesbury, who appears to have heard how he had been duped in 1670, warmly supported it, with the object probably of thereby getting rid of Clifford. He now began to be regarded as the chief upholder of Protestantism in the ministry; he rapidly lost favor with Charles, and on Sunday, September 9, 1673, was dismissed from the chancellorship.

The breaking out of the Popish Terror in 1678 marks the worst part of Shaftesbury's career. That so clear-headed a man could really have credited the extravagant lies of Oates and the other perjurers is beyond belief; and the manner in which by incessant agitation he excited the most baseless alarms, and encouraged the wildest excesses of fanatic cruelty, for nothing but party advantage, is utterly without excuse. He pressed on the Exclusion Bill with all his power, and, when that and the inquiry into the payments for secret service and the trial of the five peers, for which too he had been eager, were brought to an end by a sudden prorogation, he is reported to have declared aloud that he would have the heads of those who were the king's advisers to this course. Before the prorogation, however, he saw the invaluable Act of Habeas Corpus, which he had carried through parliament, receive the royal assent. In pursuance of his patronage of Monmouth, Shaftesbury now secured for him the command of the army sent to suppress the insurrection in Scotland, which he is supposed to have fomented. In October, 1679, the circumstances which led Charles to desire to conciliate the opposition having ceased, Shaftesbury was dismissed from his presidency and from the privy council. The king's advisers now urged him to arrest Shaftesbury; he was seized on July 2, 1681, and committed to the Tower, the judges refusing his petition to be tried or admitted to bail. In October he wrote offering to retire to Carolina if he were released. On November 24th he was indicted for high treason at the Old Bailey. He was released on bail on December 1st. Shaftesbury felt that he was no longer safe from the vengeance of the court. Failing health and the disappointment of his political plans led him now into violent courses. He appears to have entered into consultation of a treasonable kind with Monmouth and others; he himself had, he declared, ten thousand brisk boys in London ready to rise at his bidding. For some weeks he was concealed in the city and in Wapping; but, finding the schemes for a rising hang fire, he determined to flee. He went to Harwich, disguised as a Presbyterian minister, and, after a week's delay, during which he was in imminent risk of discovery, if indeed, as is very probable, his escape was not winked at by the government, he sailed to Holland on November 28, 1682, and reached Amsterdam in the beginning of December. Here he was welcomed with the jest, referring to his famous speech against the Dutch, "nondum deleta Carthago." He was made a citizen of Amsterdam, and died there of gout in the stomach on January 21, 1683. His body was sent in February to Poole, in Dorset, and was buried at Wimborne St. Giles.

SHAFTESBURY, ANTHONY ASHLEY COOPER, THIRD EARL OF, was born at Exeter House, in London, February 26, 1670–71. He became a candidate for the borough of Poole, and was returned May 21, 1695. He soon distinguished himself by a speech, which excited great attention at the time, in support of the Bill for regulating trials in cases of treason. Unfortunately, his health was so treacherous that, on the dissolution of July, 1698, he was obliged to retire from parliamentary life. He suffered much from asthma, a complaint which was aggravated by the London smoke.

Lord Ashley now retired into Holland, where he became acquainted with Le Clerc, Bayle, Benjamin Furly, the English Quaker merchant, at whose house Locke had resided during his stay at Rotterdam, and probably Limborch and the rest of the literary circle of which Locke had been a cherished and honored member nine or ten years before. To Lord Ashley this society was probably far more congenial than his surroundings in England.

After an absence of over a twelvemonth, Ashley returned to England, and soon succeeded his father as earl of Shaftesbury. He took an active part, on the Whig side, in the general election of 1700–1, and again, with more success, in that of the autumn of 1701. It is said that William III. showed his appreciation of Shaftesbury's services on this latter occasion by offering him a secretaryship of state, which, however, his failing health compelled him to decline. In August, 1703, he again settled in Holland. He returned to England, much improved in health, in August, 1704. But, though he had received immediate benefit from his stay abroad, symptoms of consumption were constantly alarming him, and he gradually became a confirmed invalid. His occupations were now almost exclusively literary, and from this time forward he was probably engaged in writing, completing, or revising the treatises which were afterward included in the *Characteristics.*

He still continued, however, to take a warm interest in politics, both home and foreign, and especially in the war against France, of which he was an enthusiastic supporter.

With the exception of a *Preface to the Sermons of Dr. Whichcote*, one of the Cambridge Platonists or latitudinarians, published in 1698, Shaftesbury appears to have printed nothing himself till the year 1708. About this time the French prophets, as they were called, attracted much attention by the extravagances and follies of which they were guilty. Various remedies of the repressive kind were proposed, but Shaftesbury maintained that their fanaticism was best encountered by "raillery" and "good-humor." In support of this view he wrote a letter to Lord Somers, dated September, 1707, which was published anonymously in the following year, and provoked several replies. In May, 1709, he returned to the subject, and printed another letter, entitled *Sensus Communis, an Essay on the Freedom of Wit and Humor*. In the same year he also published *The Moralists, a Philosophical Rhapsody*, and in the following year *Soliloquy, or Advice to an Author*. None of these pieces seem to have been printed either with his name or his initials. In 1711 appeared the *Characteristics of Men, Manners, Opinions, Times*, in three volumes, also without any name or initials on the title-page, and without even the name of a printer. These three handsome volumes contain, in addition to the four treatises already mentioned, *Miscellaneous Reflections*, now first printed, and the *Inquiry concerning Virtue or Merit*, described as "formerly printed from an imperfect copy, now corrected and published entire," and as "printed first in the year 1699."

The declining state of Shaftesbury's health rendered it necessary for him to seek a warmer climate, and in July, 1711, he set out for Italy. He settled at Naples in November, and lived there considerably over a year. His principal occupation at this time must have consisted in preparing for the press a second edition of the *Characteristics*, which appeared in 1713, soon after his death. The copy, most carefully corrected in his own handwriting, is still preserved in the British Museum. He was also engaged, during his stay at Naples, in writing the little treatise (afterward included in the *Characteristics*) entitled *A Notion of the Historical Draught or Tablature of the Judgment of Hercules*, and the letter concerning *Design*. A little before his death he had also formed a scheme of writing a Discourse on the Arts of Painting, Sculpture, Etching, etc., but when he died he had made but little progress with it. "Medals, and pictures, and antiquities," he writes to Furly, "are our chief entertainments here." His conversation was with men of art and science, "the virtuosi of this place."

The events preceding the peace of Utrecht, which he regarded as preparing the way for a base desertion of the allies, greatly troubled the last months of Shaftesbury's life. He did not, however, live to see the actual conclusion of the treaty (March 31, 1713), as he died the month before, February 4, 1712, O.S. At the time of his death he had not yet completed his forty-second year. His body was brought back by sea to England and buried at St. Giles', the family seat in Dorsetshire.

SHAFTESBURY, Anthony Ashley Cooper, Seventh Earl of, was the son of Cropley, sixth earl, and Anne, daughter of the third duke of Marlborough, and was born April 28, 1801. He entered parliament as member for the pocket borough of Woodstock in 1826; in 1830 he was returned for Dorchester; from 1831 till February, 1846, he represented the county of Dorset; and he was member for Bath from 1847 till (having previously borne the courtesy title of Lord Ashley) he succeeded his father as earl in 1851. Although giving a general support to the Conservatives, his parliamentary conduct was greatly modified by his intense interest in the improvement of the social condition of the working classes, his efforts in behalf of whom have made his name a household word. He opposed the Reform Bill of 1832, but was a supporter of Catholic emancipation, and his objection to the continuance of resistance to the abolition of the Corn Laws led him to resign his seat for Dorset in 1846. In parliament his name, more than any other, is associated with the factory legislation. He was a lord of the admiralty under Sir Robert Peel (1834–35), but on being invited to join Peel's administration in 1841 refused, having been unable to obtain Peel's support for the Ten Hours' Bill. Chiefly by his persistent efforts a Ten Hours' Bill was carried in 1847, but its operation was impeded by legal difficulties, which were only removed by successive acts, instigated chiefly by him, until legislation reached a final stage in the Factory Act of 1874. The part which he took in legislation bearing on coal mines was equally prominent. For over forty years he was president of the Ragged School Union. He was also one of the principal founders of reformatory and refuge unions, young men's Christian associations, and workingmen's institutes. He took an active interest in foreign missions, and was president of several of the most important philanthropic and religious societies of London. He died October 1, 1885.

SHAGREEN. See Shark.

SHÁHÁBÁD, a British district in the Patna division of the lieutenant-governorship of Bengal, India, between 24° 31′ and 25° 43′ N. latitude and between 83° 23′ and 84° 55′ E. longitude, with an area of 4,365 square miles.

The census of 1881 disclosed a population of 1,964,909. The administrative headquarters of the district are at

Arrah. The chief staple of Sháhábád is rice, which produces three crops during the year; wheat, barley, maize, cereals, and various other plants are also grown. The principal manufactures of the district are sugar, paper, saltpeter, blankets, coarse cotton cloth, and brass utensils. Its trade is chiefly carried on by means of permanent markets in the town and at fairs. The principal exports are rice, wheat, barley, pulses, grain, oats, linseed, carraway seed, paper, and spices; imports consist of cleaned rice, betel-nut, tobacco, sugar, molasses, salt, pepper, cotton, iron, brass, zinc, copper, lead, tin, and betel-leaf.

SHÁH JAHÁN, Mogul emperor from 1627 to 1658, and founder of Delhi.

SHÁHJAHÁNPUR, the easternmost district of the Rohilkhand division in the lieutenant-governorship of the Northwestern Provinces of British India, lying between 27° 36′ and 28° 29′ N. latitude and between 79° 23′ and 80° 26′ E. longitude. It has an area of 1,746 square miles, and is bounded on the north and northwest by Pilibhit, on the east by Hardoi and Kheri, on the south by the Ganges, separating it from Farukhabad, and on the west by Budaun and Bareilly.

In 1881 the population of Sháhjahánpur numbered 856,946. The district contains only two towns with a population exceeding 10,000, viz., SHÁHJAHÁNPUR (*q.v.*) and Tilhar (15,351). The chief agricultural products are wheat and gram in spring, and in the autumn sugar-cane, rice, joar, and bajra, and several kinds of pulses. Exports are chiefly sugar, grain of all kinds, pulses, indigo, cotton, and timber, and the imports are mainly European goods, metals, and salt. The only manufactures of any importance under European supervision are those of sugar and rum and of indigo. Sháhjahánpur was ceded to the English by treaty in 1801. During the mutiny of 1857 it became the scene of open rebellion. The Europeans were attacked when in church; three were shot down, but the remainder, aided by a hundred faithful sepoys, escaped. The force under Lord Clyde put a stop to the anarchy in April, 1858, and shortly afterward peace and authority were restored.

SHÁHJAHÁNPUR, municipal town and administrative headquarters of the above district, lies in 27° 53′ 41″ N. latitude and 79° 57′ 30″ E. longitude, on the left bank of the Deoha. It is a large place, with some stately old mosques and a castle now in ruins. The city was founded in 1647 during the reign of Sháh Jahán, whose name it bears, by Nawáb Bahádur Khán, a Pathán. It has a considerable export trade in cereals, pulses, and sugar. In 1881 the population was 74,830 (36,840 males, and 37,990 females).

SHÁHPUR, the southernmost district of the Rawal Pindi division in the lieutenant-governorship of the Punjab, India, between 31° 32′ and 32° 42′ N. latitude and between 71° 37′ and 73° 24′ E. longitude, with an area of 4,691 square miles. The district is bounded on the north by the Jhelum district, on the east by Gujrát and the Chenab, on the south by Jhang, and on the west and northwest by Dera Ismail Khan and Bannu.

The census of 1881 disclosed a population of 421,508. The only town in the district with more than 10,000 inhabitants is Bhera, with 15,165; but the administrative headquarters of the district are at the small town of Shahpur on the Jhelum river, the population of which in 1881 was 5,424. Wheat is the chief staple, and covers nearly a half of the cultivated area; bajra and cotton are the next most extensively grown crops; among other crops are sugar-cane and opium. The commercial importance of the district depends almost entirely upon its connection with the Salt range, salt being found throughout these hills. The revenue derived from this product, however, though collected in the Shahpur district, cannot properly be credited to it, as the mineral, though abundant in the Shahpur portion of the range, is worked chiefly in that part of it which lies in the Jhelum district. The chief exports are grain, rice, cotton, wool, *ghi*, and saltpeter; the imports sugar, English piece-goods and metals. Its manufactures consist of silk and cotton scarfs, toys, and felt and blankets.

SHAHRASTÁNÍ. Abu'l-Fath Mohammed ibn 'Abd al-Karím, called al-Shahrastání, a native of Shahrastán (Shehristán) in Khorásán, Persia, noted as a jurisconsult and theologian of the Ash'arite school, was born in 1086. He went to Bagdad in 1116 and stayed there three years, but afterward returned to his native place, where he died in 1153.

SHAIRP, JOHN CAMPBELL, principal of the United College, St. Andrews, Scotland, and professor of poetry at Oxford, was born at Houstoun House, Linlithgowshire, on July 30, 1819. After a short illness, he died at Ormsary, Argyllshire, on September 18, 1885.

SHAKERS is the name commonly applied to and not rejected by a religious denomination of which the official title is "The United Society of Believers in Christ's Second Appearing." The foundress was Ann Lee, who was born in Toad Lane, Manchester, England, February 29, 1736, but only privately baptized June 1, 1742. She became "a seeker after salvation," and her conversion was followed by her taking the lead in the Shaker Society, to which she promulgated a doctrine of celibacy. Their previous training had led them to expect that the second coming of Christ would be in the form of a woman; as Eve was the mother of all living, so in their new leader the Shakers recognized "the first mother or spiritual parent in the line of the female." With their new-born zeal aflame, they preached their doctrine in season and out of season, and suffered something from mob violence and from the intolerance of the constituted authorities. In 1774 Ann the Word and eight of her disciples emigrated to America, and landed at New York on August 1st of that year. Abraham Stanley, not relishing his wife's celibate creed, abandoned her for another woman. The "Believers" settled at Neuskenna, now called Watervliet, and were imprisoned for refusing to take the oath, for which reason they were suspected of being unfavorable to the cause of the Revolution. On being released they preached their creed and gradually gained converts. Ann Lee died at Watervliet, September 8, 1780. She was succeeded by James Whittaker, who died in 1788, when Joseph Meacham succeeded to the leadership and organized the society on that communistic basis which now distinguishes it. In the early history of the Shakers various charges were brought against them, including flagellation and naked dancing, but they have outlived these scandals and are now generally respected. There is an interesting sketch of a Shaker community in Howell's *Undiscovered Country.* They all work; they are capital agriculturists; they have a widespread reputation for thoroughness, frugality, and temperance. They believe in the reality of constant intercourse with the world of spirits. There are "poems" by Mother Ann which it is claimed have been dictated by her from the spirit world. They claim from time to time the exercise of the gift of tongues and the gift of healing.

SHAKESPEARE, WILLIAM, the national poet of England, the greatest dramatist that modern Europe has produced, was born in April, in the year 1564, at Stratford-upon-Avon, in the county of Warwick. The known facts of the poet's personal history are comparatively few.

The name Shakespeare is found in the Midland counties two centuries before the birth of the poet, scattered so widely that it is not easy at first sight to fix the locality of its rise or trace the lines of its progress. Several facts, however, would seem to indicate that those who first bore it entered Warwickshire from the north and west, and may therefore have migrated in early times from the neighboring marshes. The name itself is of course thoroughly English, and it is given by Camden and Verstegan as an illustration of the way in which surnames were fabricated when first introduced into England in the thirteenth century. But it is by no means improbable that some hardy borderers who had fought successfully in the English ranks may have received or assumed a significant and sounding designation that would help to perpetuate the memory of their martial prowess. We have indeed a distinct and authoritative assertion that some of Shakespeare's ancestors had served their country in this way. However this may be, families bearing the name are found during the fifteenth and sixteenth centuries in the Arden district, especially at Wroxhall and Rowington—some being connected with the priory of Wroxhall, while during the fifteenth century the names of more than twenty are enumerated as belonging to the guild of St. Ann, at Knoll near Rowington. In the roll of this guild or college are also found the representatives of some of the best families in the country, such as the Ferrerses of Tamworth and the Clintons of Coleshill. Among the members of the guild the poet's ancestors are to be looked for, and it is not improbable, as Mr. French suggests, that John and Joan Shakespeare, entered on the Knoll register in 1527, may have been the parents of Richard Shakespeare of Snitterfield, whose sons gave each to his children the favorite family names.

The poet's father was evidently a man of energy, ambition, and public spirit, with the knowledge and ability requisite for pushing his fortune with fair success. His youthful vigor and intelligence soon told in his favor, and in a short time we find him taking an active part in public affairs. He made way so rapidly indeed among his fellow-townsmen, that within five years after entering Stratford he is recognized as a fitting recipient of municipal honors; and his official appointments steadily rise in dignity and value through the various gradations of leet-juror, ale-taster, constable, affeeror, burgess, chamberlain, and alderman, until in 1568 he gains the most distinguished post of official dignity, that of high-bailiff or mayor of the town. Within twenty years after starting in business in Henley street he thus rises to the highest place in the direction of municipal affairs, presiding as their head over the deliberations of his fellow aldermen and burgesses, and as chief magistrate over the local court of record. Three years later, in 1571, he was again elected as chief alderman. There is ample evidence, too, that during these years he advanced in material prosperity as well as in municipal dignities and honors.

Of Mary Arden, the poet's mother, we know little, hardly anything directly indeed; but the little known is wholly in her favor. From the provisions of her father's will it is clear that of his seven daughters she was his favorite; and the links of evidence are now complete connecting her father Robert Arden with the great Warwickshire family of Arden, whose members had more than once filled the posts of high-sheriff and lord-lieutenant of the county. She was thus descended from an old county family, the oldest in Warwickshire, and had inherited the traditions of gentle birth and good breeding. Her ancestors are traced back, not only to Norman, but to Anglo-Saxon times.

John and Mary Shakespeare had eight children, four sons and four daughters. Of the latter, two, the first Joan and Margaret, died in infancy, before the birth of the poet, and a third, Anne, in early childhood. In addition to the poet, three sons, Gilbert, Richard, and Edmund, and one daughter, the second Joan, lived to maturity, but did not leave any children. William Shakespeare was christened in Stratford church on April 26, 1564, having most probably been born, according to tradition, on the 23d. In July of the same year the town was visited by a severe outbreak of the plague, which in the course of a few months carried off one-sixth of the inhabitants. Fortunately, however, the family of the Shakespeares wholly escaped the contagion, their exemption being probably due to the fact that they lived in the healthiest part of the town, away from the river side, on a dry and porous soil. At the back of Henley street, indeed, were the gravel pits of the guild, which were in frequent use for repairing the inundated pathways near the river after its periodical overflows. For two years and a half William, their first-born son, remained the only child of his parents, and all his mother's love and care would naturally be lavished upon him. A special bond would in this way be established between mother and child, and, his father's affairs being at the time in a highly prosperous state, Mary Shakespeare would see to it that the boy had all the pleasures and advantages suitable to his age, and which the family of a foremost Stratford burgess could easily command. Healthy outdoor enjoyment is not the least valuable part of a boy's education, and the chief recreations, available for the future dramatist in those early years would be the sports and pastimes, the recurring festivals, spectacles, and festivities of the town and neighborhood, especially the varying round of rural occupations and the celebration in the forest farms and villages of the chief incidents of the agricultural year. Seed time and harvest, summer and winter, each brought its own group of picturesque merry-makings, including some more important festivals that evoked a good deal of rustic pride, enthusiasm, and display. There were, during these years, at least three of the forest farms where the poet's parents would be always welcome, and where the boy must have spent many a happy day amid the freedom and delights of outdoor country life. At Snitterfield his grandfather would be proud enough of the curly-headed youngster with the fine hazel eyes, and his uncle Henry would be charmed at the boy's interest in all he saw and heard as he trotted with him through the byres and barns, the poultry yard and steading, or, from a safe nook on the bushy margin of the pool, enjoyed the fun and excitement of sheep-washing, or later on watched the mysteries of the shearing and saw the heavy fleece fall from the sides of the palpitating victim before the sure and rapid furrowing of the shears. He would no doubt also be present at the shearing feast and see the queen of the festival receive her rustic guests and distribute among them her floral gifts. At Wilmecote, in the solid oak-timbered dwelling of the Asbies, with its well-stocked garden and orchard, the boy would be received with cordial hospitality as well as with the attention and respect due to his parents as the proprietors and to himself as the heir of the maternal estate. At Shottery the welcome of the Shakespeares would not be less cordial or friendly, as there is evidence to show that as early as 1566 the families were known to each other, John Shakespeare having in that year rendered Richard Hathaway an important personal service. Here the poet met his future bride, Anne Hathaway, in all the charm of her sunny girlhood, and they may be said to have grown up together, except that from the difference of their ages she would reach early womanhood while he was yet a stripling. In his later youthful years he would thus be far more frequently at the Hathaway farm than at Snitterfield or the Asbies. There were, however, family connections of the Shakespeares occupying farms further afield—Hills and Webbs at Bearley and Lamberts at Barton-on-the-Heath. There was thus an exceptionally wide circle of country life open to the poet during his growing years. And in those years he must have repeatedly gone the whole picturesque round with the fresh senses and eager feeling, the observant eye and open mind, that left every detail, from the scarlet hips by the wayside to the proud tops of the eastern pines, imprinted indelibly upon his heart and brain. Hence the apt and vivid references to the scenes and scenery of his youth, the intense and penetrating glances at the most vital aspects as well as the minutest beauties of nature, with which his dramas abound. These glances are so penetrating, the result of such intimate knowledge and enjoyment, that they often seem to reveal in a moment, and by a single touch as it were, all the loveliness and charm of the objects thus rapidly flashed on the inward eye. In relation to the scenes of his youth what fresh and delightful hours at the farms are reflected in the full summer beauty and motley humors of a sheep-shearing festival in the *Winter's Tale;* in the autumn glow of the "sun-burnt sicklemen and sedge-crowned nymphs" of the masque in the *Tempest:* and in the vivid pictures of rural sights and sounds in spring and winter so musically rendered in the owl and cuckoo songs of *Love's Labor's Lost!* But, in addition to the festivities and merry-makings of the forest farms, it is clear that, in his early years, the poet had some experience of country sports proper, such as hunting, hawking, coursing, wild-duck shooting, and the like. Many of these sports were pursued by the local gentry and the yeomen together, and the poet, as the son of a well-connected burgess of Stratford, who had recently been mayor of the town and possessed estates in the county, would be well entitled to share in them, while his handsome presence and courteous bearing would be likely to insure him a hearty welcome. If any of the stiffer local magnates looked coldly upon the high-spirited youth, or resented in any way his presence among them, their conduct would be likely enough to provoke the kind of sportive retaliations that might naturally culminate in the deer-stealing adventure. However this may be, it is clear from internal evidence that the poet was practically familiar with the field sports of his day.

Shakespeare received the technical part or scholastic elements of his education in the grammar school of his native town. The school was an old foundation dating from the second half of the fifteenth century and connected with the guild of the Holy Cross. But, having shared the fate of the guild at the suppression of religious houses, it was restored by Edward VI. in 1553, a few weeks before his death. The "King's New School," as it was now called, thus represented the fresh impulse given to education throughout the kingdom during the reign of Henry VIII.'s earnest-minded son, and well sustained under the enlightened rule of his sister, the learned virgin queen. What the course of instruction was in these country schools during the second half of the sixteenth century has recently been ascertained by special research, and may be stated, at least in outline, with some degree of certainty and precision. As might have been expected, Latin was the chief scholastic drill, the thorough teaching of the Roman tongue being, as the name implies, the very purpose for which the grammar schools were originally founded. The regular teaching of Greek was indeed hardly introduced into the country schools until a somewhat later period. But the knowledge of Latin, as the language of all the learned professions, still largely used in literature, was regarded as quite indispensable. Whatever else might be neglected, the business of "gerund-grinding" was vigorously carried on, and the methods of teaching, the expedients and helps devised for enabling the pupils to read, write, and talk Latin, if rather complex and operose, were at the same time ingenious and effective. As a rule the pupil entered the grammar school at seven years old, having already acquired either at home or at the petty school the rudiments of reading and writing. During the first year the pupils were occupied with the elements of Latin grammar, the accidence, and lists of common words which were committed to memory and repeated two or three times a week, as well as further impressed upon their minds by varied exercises. In the second year the grammar was fully mastered, and the boys were drilled in short phrase-books, such as the *Sententiæ Pueriles*, to increase their familiarity with the structure and idioms of the language. In the third year the books used were Æsop's *Fables*, Cato's *Maxims*, and some good manual of school conversation, such as the *Confabulationes Pueriles.* The most popular of these manuals in Shakespeare's day was that by the eminent scholar and still more eminent teacher Corderius. The books read in the more advanced forms of the school were the *Eclogues* of Mantuanus, the *Tristia* and *Metamorphoses* of Ovid, Cicero's *Offices*, *Orations*, and *Epistles*, the *Georgics* and *Æneid* of Virgil, and in the highest form, parts of Juvenal, of the comedies of Terence and Plautus, and of the tragedies of Seneca. Shakespeare, having remained at school for at least six years, must have gone through a greater part of this course, and, being a pupil of unusual quickness and ability, endowed with rare strength of mental grip and firmness of moral purpose, he must during those years have acquired a fair mastery of Latin, both colloquial and classical. After the difficulties of the grammar had been overcome, his early intellectual cravings and poetic sensibilities would be alike quickened and gratified by the new world of heroic life and adventure opened to him in reading such authors as Ovid and Virgil. Unless the teaching at Stratford was very exceptionally poor he must have become so far familiar with the favorite school authors, such as Ovid, Tully and Virgil, as to read them intelligently and with comparative ease.

According to Rowe's account, Shakespeare was withdrawn from school about 1578, a year or two before he had completed the usual course for boys going into business or passing on to the universities. The immediate cause of the withdrawal seems to have been the growing embarrassments of John Shakespeare's affairs, the boy being wanted at home to help in the various departments of his father's business. The poet had just entered on his fifteenth year, and his school attainments and turn for affairs, no less than his native energy and ability, fitted him for efficient action in almost any fairly open career. But open careers were not numerous at Stratford, and John Shakespeare's once prosperous way of life was now hampered by actual and threatening difficulties which the zeal and affection of his son were powerless to remove or avert. No doubt the boy did his best, trying to understand his father's position, and discharging with prompt alacrity any duties that came to be done.

But, however he may have been employed, this interval of home life was for the poet a time of active growth and development, and no kind of business routine could avail to absorb his expanding powers or repress the exuberant vitality of his nature. During these critical years, to a vigorous and healthy mind such as Shakespeare possessed, action—action of an adventurous and recreative kind, in which the spirit is quickened and refreshed by new experiences—must have become an absolute necessity of existence. The necessity was all the more urgent in Shakespeare's case from the narrow circle within which the once prosperous and expanding home life was now confined.

The deer-stealing tradition, belonging perhaps to a rather later period, may be conveniently noticed here. Rowe's somewhat formal version of the narrative is to the effect that Shakespeare in his youth was guilty of an extravagance which, though unfortunate at the time, had the happy result of helping to develop his dramatic genius. This misfortune was that of being engaged with some of his companions more than once in robbing a park belonging to Sir Thomas Lucy of Charlecote. Sir Thomas, it is said, prosecuted him sharply for the offense, and in retaliation he wrote a satirical ballad upon him, which so incensed the baronet that Shakespeare thought it prudent to leave Stratford and join his old friends and associates the players in London. Other versions of the tradition exist giving fresh details, some of which are on the face of them later additions of a fictitious and fanciful kind. But it would be useless to discuss the accretions incident to any narrative, however true, orally transmitted through two or three generations before being reduced to a written shape. All that can be required or expected of such traditions is that they should contain a kernel of biographical fact, and be true in substance although possibly not in form. And tried by this test the tradition in question must certainly be accepted as a genuine contribution to our knowledge of the poet's early years. Indeed, it could hardly have been repeated again and again by the inhabitants of Stratford within a few years of Shakespeare's death if it did not embody a characteristic feature of his early life which was well known in the town. This feature was no doubt the poet's love of woodland life, and the woodland sports through which it is realized in the most animated and vigorous form.

There is, however, another aspect in which this traditional incident may be looked at, which seems at least worthy of consideration. It is possible that Sir Thomas Lucy may have been prejudiced against the Shakespeares on religious grounds, and that this feeling may have prompted him to a display of exceptional severity against their eldest son. As we have seen, he was a narrow and extreme, a persecuting and almost fanatical Protestant, and several events had recently happened calculated to intensify his bitterness against the Romanists. But, whatever may have been the actual or aggravating circumstances of the original offense, there can be no doubt that an element of truth is contained in the deer-stealing tradition. The substantial facts in the story are that Shakespeare in his youth was fond of woodland sport, and that in one of his hunting adventures he came into collision with Sir Thomas Lucy's keepers, and fell under the severe ban of that local potentate. The latter point is indirectly confirmed by Shakespeare's inimitable sketch of the formal country justice in the *Second Part of Henry IV.* and the *Merry Wives of Windsor*—"Robert Shallow, Esq.," being sufficiently identified with Sir Thomas Lucy by the pointed allusion to the coat of arms, as well as by other illusions of a more indirect but hardly less decisive kind. To talk of the sketch as an act of revenge is to treat it too seriously, or rather in too didactic and pedestrian a spirit. Having been brought into close relations with the justice, Shakespeare could hardly be expected to resist the temptation of turning to dramatic account so admirable a subject for humorous portraiture. The other point of the tradition, Shakespeare's fondness for woodland life, is supported by the internal evidence of his writings, and especially by the numerous allusions to the subject in his poems and earlier plays. The many references to woods and sports in the poems are well known; and in the early plays the allusions are not less frequent and in some respects even more striking.

There can be no doubt, therefore, that during the years of home life at Stratford Shakespeare was often in the forest. But in the latter part of the time he would be found still more frequently hastening through the fields to Shottery, paying long visits at the Hathaway farm, followed by late and reluctant leave-takings; for the next important fact in Shakespeare's history is his marriage with Anne Hathaway. This event, or rather the formal and ecclesiastical part of it, took place in the end of November, 1582, the bond for the license from the consistory court being dated on the 28th of the month. Mr. Halliwell-Phillipps has, however, sufficiently proved by detailed instances that the formal and public part of the ceremony would, according to the usage of the time, have been preceded some months earlier by the betrothal or pre-contract, which was in itself of legal validity. Shakespeare's marriage may therefore be dated from the summer of 1582, he being then in his nineteenth year, while his bride was between seven and eight years older. His first child Susanna was born in May, 1583, and, as she was baptized on the 26th, the day of her birth may have been the 23d, which would be exactly a month after her father completed his nineteenth year. In February, 1585, the family was unexpectedly enlarged by the birth of twins, a boy and a girl. Before he had attained his majority the poet had thus a wife and three children dependent upon him, with little opportunity or means apparently of advancing his fortunes in Stratford. The situation was in itself sufficiently serious. But it was complicated by his father's increasing embarrassments and multiplied family claims. Four children still remained in Henley street to be provided for—the youngest, Edmund, born in May, 1580, being scarcely five years old. John Shakespeare, too, was being sued by various creditors, and apparently in some danger of being arrested for debt. All this was enough to make a much older man than the poet look anxiously about him. But, with the unfailing sense and sagacity he displayed in practical affairs, he seems to have formed a sober and just estimate of his own powers, and made a careful survey of the various fields available for their remunerative exercise. As the result of his deliberations he decided in favor of trying the metropolitan stage and theater. He had already tested his faculty of acting by occasional essays on the provincial stage; and, once in London among the players, where new pieces were constantly required, he would have full scope for the exercise of his higher power as a dramatic poet.

The exact date of this event—of Shakspeare's leaving Stratford for London—cannot be fixed with any certainty. All the probabilities of the case, however, indicate that it must have taken place between the spring of 1585 and autumn of 1587. The anecdotes of Shakespeare's occupations on going to London are, that at first he was employed in a comparatively humble capacity about the theater, and that for a time he took charge of the horses of those who rode to see the plays, and was so successful in this work that he soon had a number of juvenile assistants who were known as Shakespeare's boys. Even in their crude form these traditions embody a tribute to Shakespeare's business promptitude and skill. If there is any truth in them they may be taken to indicate that while filling some subordinate post in the theater Shakespeare perceived a defective point in the local arrangements, or heard the complaints of the mounted gallants as to the difficulty of putting up their horses. His provisions for meeting the difficulty seem to have been completely and even notoriously successful.

But his leisure hours during his first years in London would naturally be devoted to continuing his education and equipping himself as fully as possible for his future work. It was probably during this time, as Mr. Halliwell-Phillipps suggests, that he acquired the working knowledge of French and Italian that his writings show he must have possessed. And it is perhaps now possible to point out the sources whence his knowledge of these languages was derived, or at least the master under whom he chiefly studied them. The most celebrated and accomplished teacher of French and Italian in Shakespeare's day was the resolute John Florio, who, after leaving Magdalen College, Oxford, lived for years in London, engaged in tutorial and literary work and intimately associated with eminent men of letters and their noble patrons. After the accession of James I., Florio was made tutor to Prince Henry, received an appointment about the court, became the friend and personal favorite of Queen Anne (to whom he dedicated the second edition of his Italian dictionary, entitled the *World of Words*), and died full of years and honors in 1625, having survived Shakespeare nine years. Florio had married the sister of Daniel the poet, and Ben Jonson presented a copy of *The Fox* to him, with the inscription, "To his loving father and worthy friend Master John Florio, Ben Jonson seals this testimony of his friendship and love." Daniel writes a poem of some length in praise of his translation of Montaigne, while other contemporary poets contribute commendatory verses which are prefixed to his other publications. There are substantial reasons for believing that Shakespeare was also one of Florio's friends, and that during his early years in London he evinced his friendship by yielding for once to the fashion of writing this kind of eulogistic verse.

But, whatever his actual relation to the Italian scholar may have been, Shakespeare, on reaching London and beginning to breathe its literary atmosphere, would naturally betake himself to the study of Italian. At various altitudes the English Parnassus was at that time fanned by soft airs, swept by invigorating breezes, or darkened by gloomy and infected vapors from the south. In other words, the influence of Italian literature, so dominant in England during the second half of the sixteenth century, may be said to have reached its highest point at the very time when Shakespeare entered on his poetic and dramatic labors. No doubt in the case of Italian poets, as in the case of Latin authors like Ovid, whose works he was familar with in the original, Shakespeare would also diligently read the translations, especially the translations into English verse. For in reading such works as Golding's Ovid, Harrington's Ariosto, and Fairfax's Tasso, he would be increasing his command over the elements of expressive phrase and diction which were the verbal instruments, the material vehicle, of his art. But, besides studying the translations of the Italian poets and prose writers made available for English readers, he would naturally desire to possess, and no doubt acquired for himself, the key that would unlock the whole treasure-house of Italian literature. The evidence of Shakespeare's knowledge of French is more abundant and decisive, so much so as hardly to need express illustration. There can be little doubt, therefore, that during his early years in London he acquired a fair knowledge of both French and Italian.

But, while pursuing these collateral aids to his higher work, there is abundant evidence that Shakespeare also devoted himself to that work itself. As early as 1592 he is publicly recognized, not only as an actor of distinction, but as a dramatist whose work had excited the envy and indignation of his contemporaries. Indeed, all the three parts of *Henry VI.* in the revised form appear to have been acted during the spring and summer of that year. It is not improbable that two or three of Shakespeare's early comedies may also have been produced very shortly after. Of Shakespeare's amazing industry and conspicuous success the next few years supply ample evidence. Within six or seven years he not only produced the brilliant reflective and descriptive poems of *Venus and Adonis* and *Lucrece*, but at least fifteen of his dramas, including tragedies, comedies, and historical plays. Having found his true vocation, Shakespeare works during these years as a master, having full command over the materials and resources of his art. The dramas produced have a fullness of life and a richness of imagery, a sense of joyousness and power, that speak of the writer's exultant absorption and conscious triumph in his chosen work. The sparkling comedies and great historical plays belonging to this period evince the ease and delight of an exuberant mind realizing its matured creations.

Never before, except perhaps in the Athens of Pericles, had all the elements and conditions of a great national drama met in such perfect union. As we have seen, the popular conditions supplied by the stir of great public events and the stimulus of an appreciative audience were present in exceptional force. With regard to the stage conditions,—the means of adequate dramatic representation,—public theaters had for the first time been recently established in London on a permanent basis. In 1574 a royal license had been granted by the queen to the earl of Leicester's company "to use, exercise, and occupy the art and faculty of playing Comedies, Tragedies, Interludes, and Stage Plays, and such other like as they have been already used and studied, as well for the recreation of our loving subjects as for our solace and pleasure when we shall think good to see them;" and, although the civil authorities resisted the attempt to establish a public theater within the city, two or three were speedily erected just outside its boundaries, in the most convenient and accessible suburbs,—the Curtain and the Theater in Shoreditch, beyond the northern boundary, and the Blackfriars theater within the precincts of the dissolved monastery, just beyond the civic jurisdiction on the western side. A few years later other houses were built on the southern side of the river,—the Rose near the foot of London Bridge, and the Hope and Swan further afield. There was also at Newington Butts a place of recreation and entertainment for the archers and holiday people, with a central building which, like the circus at Paris Garden, was used during the summer months for dramatic purposes. These theaters were occupied by different companies in turn, and Shakespeare, during his early years in London, appears to have acted at several of them.

When Shakespeare went to London there were theaters on both sides of the water—the outlying houses being chiefly used during the summer and autumn months, while the Blackfriars, being roofed in and protected from the weather, was specially used for performances during the winter season. . In spite of the persistent opposition of the lord mayor and city aldermen, the denunciations of Puritan preachers and their allies in the press, and difficulties arising from intermittent attacks of the plague and the occasional intervention of the court authorities, the theaters had now taken firm root in the metropolis; and, strong in royal favor, in noble patronage, and above all in popular support, the stage had already begun to assume its higher functions as the living organ of the national voice, the many-colored mirror and reflection of the national life. A few years later the companies of players and the theaters they occupied were consolidated and placed on a still firmer public basis. Even before the building of the Globe, the house at Newington where three of Marlowe's most important plays and some of Shakespeare's early tragedies were produced was often crowded to the doors. In the summer of 1592, when the *First Part of Henry VI.*, as revised by Shakespeare, was acted, the performance was so popular that, we are told by Nash, 10,000 spectators witnessed it in the course of a few weeks. It is true that even in the best theaters the appliances in the way of scenes and stage machinery were of the simplest description, change of scene being often indicated by the primitive device of a board with the name painted upon it. But players and playwrights, both arts being often combined in the same person, knew their business thoroughly well, and justly relied for success on the more vital attractions of powerful acting, vigorous writing, and practiced skill in the construction of their pieces. In the presence of strong passions expressed in kindling words and powerfully realized in living action, gesture, and incident, the absence of canvas sunlight and painted gloom was hardly felt. Or, as the stirring choruses in *Henry V.* show, the want of more elaborate and realistic scenery was abundantly supplied by the excited fancy, active imagination, and concentrated interest of the spectators.

Shakespeare's active dramatic career in London lasted about twenty years, and may be divided into three tolerably symmetrical periods. The first extends from the year 1587 to about 1593–94; the second from this date to the end of the century; and the third from 1600 to about 1608, soon after which time Shakespeare ceased to write regularly for the stage, was less in London and more and more at Stratford. Some modern critics add to these a fourth period, including the few plays which from internal as well as external evidence must have been among the poet's latest productions. As the exact dates of these plays are unknown, this period may be taken to extend from 1608 to about 1612. The three dramas produced during these years are, however, hardly entitled to be ranked as a separate period. They may rather be regarded as supplementary to the grand series of dramas belonging to the third and greatest epoch of Shakespeare's productive power. To the first period belong Shakespeare's early tentative efforts in revising and partially rewriting plays produced by others that already had possession of the stage. These efforts are illustrated in the three parts of *Henry VI.*, especially the second and third parts, which bear decisive marks of Shakespeare's hand, and were to a great extent recast and rewritten by him. It is clear from the internal evidence thus supplied that Shakespeare was at first powerfully affected by "Marlowe's mighty line." This influence is so marked in the revised second and third parts of *Henry VI.* as to induce some critics to believe Marlowe must have had a hand in the revision. These passages are, however, sufficiently explained by the fact of Marlowe's influence during the first period of Shakespeare's career. To the same period also belong the earliest tragedy, that of *Titus Andronicus*, and the three comedies—*Love's Labor's Lost*, *The Comedy of Errors*, and the *Two Gentlemen of Verona*. These dramas are all marked by the dominant literary influences of the time. They present features obviously due to the revived and widespread knowledge of classical literature, as well as to the active interest in the literature of Italy and the South. *Titus Andronicus*, in many of its characteristic features, reflects the form of Roman tragedy almost universally accepted and followed in the earlier period of the drama. This form was supplied by the Latin plays of Seneca, their darker colors being deepened by the moral effect of the judicial tragedies and military conflicts of the time. The execution of the Scottish queen and the Catholic conspirators who had acted in her name, and the destruction of the Spanish Armada, had given an impulse to tragic representations of an extreme type. This was undoubtedly rather fostered than otherwise by the favorite exemplars of Roman tragedy. The *Medea* and *Thyestes* of Seneca are crowded with pagan horrors of the most revolting kind. It is true these horrors are usually related, not represented, although in the *Medea* the maddened heroine kills her children on the stage. But from these tragedies the conception of the physically horrible as an element of tragedy was imported into the early English drama, and intensified by the realistic tendency which the events of the time and the taste of their ruder audiences had impressed upon the common stages. This tendency is exemplified in *Titus Andronicus*, obviously a very early work, the signs of youthful effort being apparent not only in the acceptance of so coarse a type of tragedy but in the crude handling of character and motive, and the want of harmony in working out the details of the dramatic conception. Kyd was the most popular contemporary representative of the bloody school, and in the leading motives of treachery, concealment, and revenge there are points of likeness between *Titus Andronicus* and the *Spanish Tragedy*. But how promptly and completely Shakespeare's nobler nature turned from this lower type is apparent from the fact that he not only never reverted to it but indirectly ridicules the piled-up horrors and extravagant language of Kyd's plays.

The early comedies in the same way are marked by the dominant literary influences of the time, partly classic, partly Italian. In the *Comedy of Errors*, for example, Shakespeare attempted a humorous play of the old classical type, the general plan and many details being derived directly from Plautus. In *Love's Labor's Lost* many characteristic features of Italian comedy are freely introduced: the pedant "Holofernes," the curate "Sir Nathaniel," the fantastic braggadocio soldier "Armado," are all well-known characters of the contemporary Italian drama. Of this comedy, indeed, Gervinus says, "the tone of the Italian school prevails here more than in any other play. The redundance of wit is only to be compared with a similar redundance of conceit in Shakespeare's narrative poems, and with the Italian style which he had early adopted." These comedies display another sign of early work in the mechanical exactness of the plan and a studied symmetry in the grouping of the chief personages of the drama. In the *Two Gentlemen of Verona*, as Professor Dowden points out, "'Proteus' the fickle is set against 'Valentine' the faithful, 'Silvia' the light and intellectual against 'Julia' the ardent and tender, 'Lance' the humorist against 'Speed' the wit." So in *Love's Labor's Lost*, the king and his three fellow-students balance the princess and her three ladies, and there is a symmetrical play of incident between the two groups. The arrangement is obviously more artificial than spontaneous, more mechanical than vital and organic. But toward the close of the first period Shakespeare had fully realized his own power and was able to dispense with these artificial supports. Indeed, having rapidly gained knowledge and experience, he had before the close written plays of a far higher character than any which even the ablest of his contemporaries had produced. He had firmly laid the foundation of his future fame in the direction both of comedy and tragedy, for, besides the comedies already referred to, the first sketches of *Hamlet* and *Romeo and Juliet*, and the tragedy of *Richard III.*, may probably be referred to this period.

Another mark of early work belonging to these dramas is the lyrical and elegiac tone and treatment associated with the use of rhyme, of rhyming couplets and stanzas. Spenser's musical verse had for the time elevated the character of rhyming meters by identifying them with the highest kinds of poetry, and Shakespeare was evidently at first affected by this powerful impulse. He rhymed with great facility, and delighted in the gratification of his lyrical fancy and feeling which the more musical rhyming meters afforded. Rhyme accordingly has a considerable and not inappropriate place in the earlier romantic comedies. The *Comedy of Errors* has indeed been described as a kind of lyrical farce in which the opposite qualities of elegiac beauty and comic effect are happily blended. Rhyme, however, at this period of the poet's work is not restricted to the comedies. It is largely used in the tragedies and histories as well, and plays even an important part in historical drama so late as *Richard II.* Shakespeare appears, however, to have worked out this favorite vein, and very much taken leave of it, by the publication of his descriptive and narrative poems, the *Venus and Adonis* and the *Lucrece*, although the enormous popularity of these poems might almost have tempted him to return again to the abandoned metrical form. The only considerable exception to the disuse of rhyming meters and lyrical treatment is supplied by the *Sonnets*, which, though not published till 1609, were probably begun early, soon after the poems, and written at intervals during eight or ten of the intervening years. Into the many vexed questions connected with the history and meaning of these poems it is impossible to enter. The attempts recently made by the Rev. W. A. Harrison and Mr. T. Tyler to identify the "dark lady" of the later sonnets, while of some historical interest, cannot be regarded as successful. And the identification, even if rendered more probable by the discovery of fresh evidence, would not clear up the difficulties, biographical, literary, and historical, connected with these exquisite poems. It is perhaps enough to say with Prof. Dowden that in Shakespeare's case the most natural interpretation is the best, and that, so far as they throw light on his personal character, the sonnets show that "he was capable of measureless personal devotion; that he was tenderly sensitive, sensitive above all to every diminution or alteration of that love his heart so eagerly craved; and that, when wronged, although he suffered anguish, he transcended his private injury and learned to forgive."

Whatever question may be raised with regard to the superiority of some of the plays belonging to the first period of Shakespeare's dramatic career, there can be no question at all as to any of the pieces belonging to the second period, which extends to the end of the century. During these years Shakespeare works as a master, having complete command over the materials and resources of the most mature and flexible dramatic art. "To this stage," says Mr. Swinburne, "belongs the special faculty of faultless, joyous, facile command upon each faculty required of the presiding genius for service or for sport. It is in the middle period of his work that the language of Shakespeare is most limpid in its fullness, the style most pure, the thought most transparent through the close and luminous raiment of perfect expression." This period includes the magnificent series of historical plays—*Richard II.*, the two parts of *Henry IV.*, and *Henry V.*—and a double series of brilliant comedies. The *Midsummer Night's Dream*, *All's Well that Ends Well*, and the *Merchant of Venice* were produced before 1598, and during the next three years there appeared a still more complete and characteristic group including *Much ado about Nothing*, *As you Like it* and *Twelfth Night.* These comedies and historical plays are all marked by a rare harmony of reflective and imaginative insight, perfection of creative art, and completeness of dramatic effect. Before the close of this period, in 1598, Francis Meres paid his celebrated tribute to Shakespeare's superiority in lyrical, descriptive, and dramatic poetry, emphasizing his unrivaled distinction in the three main departments of the drama—comedy, tragedy and historical play. And from this time onward, the contemporary recognitions of Shakespeare's eminence as a poet and dramatist rapidly multiply, the critics and eulogists being in most cases well entitled to speak with authority on the subject.

In the third period of Shakespeare's dramatic career years had evidently brought enlarged vision, wider thoughts, and deeper experiences. While the old mastery of art remains, the works belonging to this period seem to bear traces of more intense moral struggles, larger and less joyous views of human life, more troubled, complex, and profound conceptions and emotions. Comparatively few marks of the lightness and animation of the earlier works remain, but at the same time the dramas of this period display an unrivaled power of piercing the deepest mysteries and sounding the most tremendous and perplexing problems of human life and human destiny. To this period belong the four great tragedies—*Hamlet*, *Macbeth*, *Othello*, *Lear;* the three Roman plays—*Coriolanus*, *Julius Cæsar*, *Antony and Cleopatra;* the two singular plays whose scene and personages are Greek but whose action and meaning are wider and deeper than either Greek or Roman life—*Troilus and Cressida* and *Timon of Athens;* and one comedy—*Measure for Measure*, which is almost tragic in the depth and intensity of its characters and incidents. The four great tragedies represent the highest reach of Shakespeare's dramatic power, and they sufficiently illustrate the range and complexity of the deeper problems that now occupied his mind. *Timon* and *Measure for Measure*, however, exemplify the same tendency to brood with meditative intensity over the wrongs and miseries that afflict humanity. These works sufficiently prove that during this period Shakespeare gained a disturbing insight into the deeper evils of the world, arising from the darker passions, such as treachery and revenge. But it is also clear that, with the larger vision of a noble, well-poised nature, he at the same time gained a fuller perception of the deeper springs of goodness in human nature, of the great virtues of invincible fidelity and unwearied love, and he evidently received not only consolation and calm but new stimulus and power from the fuller realization of these virtues. The typical plays of this period thus embody Shakespeare's ripest experience of the great issues of life. In the four grand tragedies the central problem is a profoundly moral one. It is the supreme internal conflict of good and evil among the central forces and higher elements of human nature, as appealed to and developed by sudden and powerful temptation, smitten by accumulated wrongs, or plunged in overwhelming calamities. As the result, we learn that there is something infinitely more precious in life than social ease or worldly success—nobleness of soul, fidelity to truth and honor, human love and loyalty, strength and tenderness, and trust to the very end. In the most tragic experiences this fidelity to all that is best in life is only possible through the loss of life itself. But when "Desdemona" expires with a sigh and "Cordelia's" loving eyes are closed, when "Hamlet" no more draws his breath in pain and the tempest-tossed "Lear" is at last liberated from the rack of this tough world, we feel that, death having set his sacred seal on their great sorrows and greater love, they remain with us as possessions forever. In the three dramas belonging to Shakespeare's last period, or rather which may be said to close his dramatic career, the same feeling of severe but consolatory calm is still more apparent. If the deeper discords of life are not finally resolved, the virtues which soothe their perplexities and give us courage and endurance to wait, as well as confidence to trust the final issues—the virtues of forgiveness and generosity, of forbearance and self control—are largely illustrated. This is a characteristic feature in each of these closing dramas, in the *Winter's Tale*, *Cymbeline*, and the *Tempest*. The *Tempest* is supposed, on tolerably good grounds, to be Shakespeare's last work, and in it we see the great magician, having gained by the wonderful experience of life, and the no less wonderful practice of his art, serene wisdom, clear and enlarged vision, and beneficent self-control, break his magical wand and retire from the scene of his triumphs to the home he had chosen amid the woods and meadows of the Avon, and surrounded by the family and friends he loved.

We must now briefly summarize the few remaining facts of the poet's personal history. The year 1596 was marked by considerable family losses. In August Shakespeare's only son Hamnet died, in the twelfth year of his age. With his strong domestic affections and cherished hopes of founding a family, the early death of his only boy must have been for his father a severe blow. It was followed, in December, by the death of Shakespeare's uncle Henry, the friend of his childhood and youth, the protector and encourager of his boyish sports and enterprises at Bearley, Snitterfield, and Fulbroke. A few months later the Shakespeare household at Snitterfield, so intimately associated for more than half a century with the family in Henley street, was finally broken up by the death of the poet's aunt Margaret, his uncle Henry's widow. Although the death of his son and heir had diminished the poet's hope of founding a family, he did not in any way relax his efforts to secure a permanent and comfortable home for his wife and daughters at Stratford. As early as 1597, when he had pursued his London career for little more than ten years, he had saved enough to purchase the considerable dwelling-house in New Place, Stratford, to which he afterward retired. This house, originally built by Sir Hugh Clopton and called the "Great House," was one of the largest mansions in the town, and the fact of Shakespeare having acquired such a place as his family residence would at once increase his local importance. From time to time he made additional purchases of land about the house and in the neighborhood. In 1602 he largely increased the property by acquiring 107 acres of arable land, and later on he added to this twenty acres of pasture land, with a convenient cottage and garden in Chapel lane, opposite the lower grounds of the house. Within a few years his property thus comprised a substantial dwelling house with large garden and extensive outbuildings, a cottage fronting the lower road, and about 137 acres of arable and pasture land. During these years Shakespeare made another important purchase that added considerably to his income. From the letter of a Stratford burgess to a friend in London, it appears that as early as 1597 Shakespeare had been making inquiry about the purchase of tithes in the town and neighborhood. And in 1605 he bought the unexpired lease of tithes, great and small, in Stratford and two adjoining hamlets, the lease having still thirty years to run. This purchase yielded him an annual income of £38 a year, equal to upward of £350 a year at the present time. The last purchase of property made by Shakespeare of which we have any definite record is at once so interesting and perplexing as to have stimulated various conjectures on the part of his biographers. This purchase carries us away from Stratford back to London, to the immediate neighborhood of Shakespeare's dramatic labors and triumphs. It seems that in March, 1613, he bought a house with a piece of ground attached to it a little to the southwest of St. Paul's cathedral, and not far from the Blackfriars theater. The purchase of this house in London after he had been for some years settled at Stratford has led some critics to suppose that Shakespeare had not given up all thought of returning to the metropolis, or at least of spending part of the year there with his family in the neighborhood he best knew and where he was best known. The ground of this supposition is, however, a good deal destroyed by the fact that soon after acquiring this town house Shakespeare let it for a lease of ten years. He may possibly have bought the property as a convenience to some of his old friends who were associated with him in the purchase. In view of future contingencies it would obviously be an advantage to have a substantial dwelling so near the theater in the hands of a friend. It was indeed by means of a similar purchase that James Burbage had originally started and established the Blackfriars theater.

It seems most probable that soon after the checkered domestic events of this year, as soon as he could conveniently terminate his London engagements, Shakespeare decided on retiring to his native place. He had gained all he cared for in the way of wealth and fame, and his strongest interests, personal and relative, were now centered in Stratford. But on retiring to settle in his native town he had nothing of the dreamer, the sentimentalist, or the recluse about him. His healthy natural feeling was far too strong, his character too manly and well-balanced, to admit of any of the so-called eccentricities of genius. He retired as a successful professional man who had gained a competence by his own exertions and wished to enjoy it at leisure in a simple, social, rational way. He knew that the competence he had gained, the lands and wealth he possessed, could only be preserved, like other valuable possessions, by good management and careful husbandry. And, taught by the sad experience of his earlier years, he evidently guided the business details of his property with a firm and skillful hand, was vigilant and scrupulously just in his dealings, respecting the rights of others, and, if need be, enforcing his own. He sued his careless and negligent debtors in the local court of record, had various commercial transactions with the corporation, and took an active interest in the affairs of the borough. And he went now and then to London, partly on business connected with the town, partly no doubt to look after the administration and ultimate disposal of his own theatrical property, and partly it may be assumed for the pleasure of seeing his old friends and fellow dramatists. Even at Stratford, however, Shakespeare was not entirely cut off from his old associates in arts and letters, his hospitable board being brightened at intervals by the presence, and animated by the wit, humor, and kindly gossip, of one or more of his chosen friends. Two among the most cherished of his companions and fellow poets, Drayton and Ben Jonson, had paid a visit of this kind to Stratford, and been entertained by Shakespeare only a few days before his death, which occurred almost suddenly on April 23, 1616. After three days' illness the great poet was carried off by a sharp attack of fever, at that time one of the commonest scourges, even of country towns, and often arising then as now, only more frequently then than now, from the neglect of proper sanitary precautions. According to tradition the 23d of April was Shakespeare's birthday, so that he died on the completion of the 52d year of his age. Three days later he was laid in the chancel of Stratford church, on the north wall of which his monument, containing his bust and epitaph, was soon afterward placed, most probably by the poet's son-in-law, Dr. John Hall. Shakespeare's widow, the Anne Hathaway of his youth, died in 1623, having survived the poet seven years, exactly the same length of time that his mother Mary Arden had outlived her husband. Elizabeth Hall, the poet' s grandchild, was married twice, first to Mr. Thomas Nash of Stratford, and in 1649, when she had been two years a widow, to Mr. afterwards Sir John Barnard of Abington in Northamptonshire. Lady Barnard had no family by either husband, and the three children of the poet's second daughter Judith (who had married Richard Quiney of Stratford, two months before her father's death) all died comparatively young. At Lady Barnard's death in 1670 the family of the poet thus became extinct. By his will made a few weeks before his death Shakespeare left his landed property, the whole of his real estate indeed, to his eldest daughter Mrs. Susanna Hall, under strict entail to her heirs. He left also a substantial legacy to his second daughter and only remaining child Mrs. Judith Quiney, and a remembrance to several of his friends, including his old associates at the Blackfriars theater, Burbage, Heminge, and Condell,—the two latter of whom edited the first collection of his dramas published in 1623. The will also included a bequest to the poor of Stratford.

SHALLOT, a bulb used in cookery.

SHAMANISM is the name commonly given to the type of religion which once prevailed among all the Ural-Altaic peoples,—Tungus, Mongol, and Turkish,—and which still lives in various parts of northern Asia in spite of the progress of Mohammedanism, Buddhism, and Christianity. The shaman himself (in Turkish, *kam*) is a wizard-priest, closely akin to the medicine-men of savage tribes in other parts of the world. His two chief functions are to perform sacrifice, with which is conjoined the procuring of oracles, and to purify houses after a death, preventing the dead man from continuing his injurious presence among the living. The ceremonies have a dramatic character, the wizard acting an ascent to the heavens or a descent to the under-world, and holding colloquy with their denizens in scenes of great excitement ending in ecstasy and physical collapse.

SHAMMAI, a Jewish rabbi, sometimes called הַזָּקֵן, "the elder," was the contemporary of HILLEL (*q.v.*) and the head of a rival school. Of his personal history nothing is known. The tendency of Shammai and his school is represented as having been toward a more scrupulously and burdensomely literal construction of the law than was thought necessary by Hillel; but their differences so far as known turned upon very trifling minutiæ. One example of his rigor will suffice. It is related of him in the *Mishnah* that a grandson having been born to him during the feast of tabernacles he caused the ceiling to be removed and the bed to be canopied with branches, in order that the child also might observe the solemnity according to the law

SHAMOKIN, a post-town of Northumberland County, Penn., in the center of the anthracite coal region of that State, is located on the Mahanoy and Shamokin branch of the Philadelphia and Reading railroad, eighteen miles from Sunbury, the county seat. Shamokin is also the terminus of the Shamokin, Sunbury and Lewisburg road at its junction with the Shamokin division of the Northern Central road, also the terminus of the Easton and Shamokin branch of the Lehigh Valley railroad. It is the shipping and receiving point for the coal regions in that portion of the State, and the output of the mines, together with business annually disposed of in their operation, aggregates largely. The town maintains ten churches, an adequate school system, and a municipal form of government generally. It contains two banks, one daily and two weekly papers, several hotels, two machine shops, and a line of manufactures requisite to the public demand. The population, in 1890, was 14,403.

SHANGHAI, a city of China. The native city of Shanghai is situated in 31° 15′ N. latitude and 121° 27′ E. longitude, and stands on the left or western bank of the Hwang-p'u river, about twelve miles from the point where that river empties itself into the estuary of the Yang-tsze-kiang. The walls which surround it are about three and one-half miles in circumference, and are pierced by seven gates.

On the eastern face of the city, between the walls and the river, stands the principal suburb, off which the native shipping lies anchored. The native town has thus nothing to recommend it except its geographical position. Situated in the extreme eastern portion of the province of Kiang-soo, and possessing a good and commodious anchorage, as well as an easy access to the ocean, it forms the principal port of central China. But though thus favorably situated as an emporium of trade Shanghai did not attract the attention of foreign diplomatists until the outbreak of the war of 1841, when the inhabitants purchased protection from the bombarding propensities of Admiral Parker by the payment of a ransom of one million taels. In the Nanking treaty, which was signed in the following year, Shanghai was included among the four new ports which were thrown open to trade by the terms of that document. In 1843 Sir George Balfour, then Captain Balfour, was appointed British consul, and it was on his motion that the site of the present English settlement was separated from the native city by a narrow strip of land which was subsequently selected as the site of the French settlement. Later the Americans established themselves on the other side of the Soochow creek, on a piece of land fronting on the river, which there makes a sharp turn in an easterly direction.

It was expected that the three settlements—the British, French, and Americans—would have been incorporated into one municipality, but international jealousy prevented the fulfillment of the scheme, and it was not until 1863 that the Americans threw in their lot with the British.

During the period from 1856 to 1864 the trade of Shanghai increased by leaps and by bounds, and its prosperity culminated between 1860 and 1864, when, in addition to the ordinary commerce, the influx of Chinese into the foreign settlement in consequence of the advance eastward of the T'ai-p'ing rebels added enormously to the value of land and to the profits of the leaseholders. Since then the genuine trade of the port has steadily advanced, subject of course to occasional fluctuations. For example, between the years 1878 and 1881 the gross value of the trade increased from 110,956,274 taels to 141,291,357 taels. In 1883, however, this amount fell to 110,433,531 taels, while in 1884 it rose again to

113,215,520 taels, although at this time, as will be remembered, hostilities were being carried on between France and China. In the same year 53,562 bales of silk were exported, as against 47,807 bales in 1883, and 27,084,675 pounds of green tea, as against 25,336,041 pounds in 1883. In black tea there was a falling off, the respective figures being 43,813,058 and 48,251,637 pounds. The total burden of foreign steamers which entered and cleared at Shanghai during 1884 was 3,145,242 tons. Of this amount 2,238,433 tons were British, 500,222 were American, 188,484 were Japanese, 93,226 were Germans, 88,983 were French, 24,572 were Russian, and 11,322 were Danish.

According to the latest estimate the native population of the city and suburbs of Shanghai amounts to 156,000. When to this number the boat population, amounting to 11,000, and the mixed inhabitants of the foreign settlements, numbering 145,500, are added, a total is reached of 312,500 souls.

A handsome bund runs along the river frontage of the three foreign settlements, and the public buildings in the British settlement are large and fine. The Cathedral, which is built in the Gothic style, is a notable example of Sir Gilbert Scott's skill as an architect, and the municipal offices, club-house, and hospitals are all admirable in their way. Shanghai is now connected with Peking by a telegraph, which will doubtless before long be supplemented by a railway. Some years ago a short railway was laid down between Shanghai and Woosung by some foreigners who wished to force the pace at which China was progressing. But the time had not come when such a step would be adopted by the Chinese, and after a few weeks' existence the plant was bought by the native authorities and shipped to Formosa, where it has since been allowed to rust and rot. The climate of Shanghai is essentially unhealthy. It lies low, and, though the early winter is enjoyable, snow and ice being occasionally seen, the summer months are swelteringly hot. Fever, dysentery and cholera are unfortunately common complaints, and it is only by frequent trips to Japan and Chefoo that the residents are able to preserve health and strength. But, notwithstanding every disadvantage, the position occupied by Shanghai as a centre of trade, situated as it is at the mouth of the Yang-tsze-kiang, in the immediate neighborhood of the richest silk and tea districts, and in proximity to Japan and the newly-opened ports of Corea, insures for it an increasing volume of commerce and a widening prosperity in the future.

SHANNON. See IRELAND.

SHANS. This name is applied to a number of for the most part semi-independent communities occupying a region bounded on the west by Burmah and Assam, north and northeast by the Chinese province of Yunnan, east by Tong-king, and south by Siam. Ethnologically the race has a much wider extension, including the Siamese (see SIAM), and also, according to Garnier and Colquhoun, the hill tribes around the Tong-king delta and various tribes of Kwang-tung and Kwang-se, and extending across the north of Burmah into Assam. It is also widely diffused through southwestern Yunnan. Terrien de Lacouperie considers it allied to the Mon, the Mung, and the Pa, and places its early home in the mountains north of Sze-chuen, whence, not having amalgamated with the growing Chinese empire, it was gradually forced southward. The traditions current of their origin, too, though localized by each in its own habitat, are closely similar.

The Shans probably appeared on the upper Irawadi nearly 2,000 years ago, but Burmese and Shan traditions agree that they were established some centuries earlier on the upper waters of the Shweli and on the Salwin and adjacent valleys on the southwest frontiers of Yunnan. Here, at all events, in the seventh and eighth centuries, we hear of the growth of that power which, temporarily broken by Burmah in the eleventh century, reached its highest development in the thirteenth.

The Burmese Shan States, especially those more remote from Mandalay, have latterly become practically independent; and, the tyranny which led to extensive southward migration having ceased, the stream is partly returning northward. Descendants, too, of the population deported by Siam from Kiang Sen about a hundred years ago are now by the king's permission returning to people that fertile territory. The great Shan state of Kiang Hung has now accepted the dictation of China, to whom in fact, like some of its lesser neighbors, it has always paid certain taxes, while acknowledging the supremacy of Burmah. Kiang Tung to the south, which has been Burmese for over a century, has lately made overtures to Siam.

Each Shan state is governed by a *tsobwa* (*chao p'hya*), or supreme chief aided by a council, and often by a coadjutor. Where the Shans are in immediate contact with one of their great neighbors their habits and customs are necessarily modified; otherwise, speaking generally, civilization increases southward. Religion is nominally Buddhist, and the priests, though their lives are usually far from correct, have great influence. Slavery is general; the supply is recruited partly by raids on neighboring hill tribes; the Indo-Chinese practice of slavery for debt also prevails. The slaves are not ill-treated, and are chiefly employed in field labor by the Chaos, who own great numbers. In appearance the North Shans are sallow, but hardly darker than South Europeans, and are characterized by a short broad flat face, more elongated and nearer the Tartar type in the upper classes; they have red cheeks, brown eyes hardly oblique, black hair, nose almost aquiline, and are of medium height. The Chinese Shans are much smaller, with squat figures, prominent cheekbones, and oblique eyes.

The practice of tattooing prevails in some districts, down to the upper waters of the Me-nam, and it occurs also among the Laos in the southeast, the tattooed being known as the black-bellied, the non-tattooed as the white-bellied. Drunkenness, except at festivals, is rare. Gambling is common, whole families being sold into slavery to pay debts thus contracted. Public gaming and the sale of spirits and opium are monopolies. They show much artistic taste in the beautiful colors of their textile fabrics, and great aptitude for trade.

Tea is found, both wild and cultivated, from Zimmé to Kiang Tung. Opium is exported to Mandalay and to China. Indian corn, sugar, and tobacco are grown in the low grounds, and excellent cotton and indigo (which also grows wild in the hills). Teak has long been worked by Anglo-Burmese in the eastern affluents of the Toong-yen and neighboring valleys, and has become comparatively scarce west of the Me-ping; but it grows freely in the hills and valleys around Kiang Sen and Lagong, and in the hill region of eastern Siam, where, however, it is of inferior quality. Silk is produced, and iron, copper, and silver-lead (galena) ores are worked.

SHARK. (See ICHTHYOLOGY.) Sharks are almost exclusively inhabitants of the sea, but some species freely enter the mouths of large rivers, and one species (*Carcharias gangeticus*) occurs frequently high up in the large rivers of India, and in the Tigris about Bagdad, at a distance of 350 miles from the Persian Gulf in a straight line, and has even been reported from a lake in Viti Levu (Fiji Islands) which is shut off from the sea by a cataract. Altogether some hundred and fifty different species have been described. With regard to their habits many are littoral species, the majority pelagic, and a few are known to belong to the bathybial fauna, having hitherto been obtained down to a depth of 500 fathoms.

Littoral Sharks.—The littoral forms are of small size, and generally known under the name of "dog-fishes," "hounds," etc. They live on the bottom, sometimes close inshore, and feed on small marine animals or on any animal substance. The following are deserving of special notice: The Tope (*Galeus*) is common on the coast not only of England, Ireland, and of the more southern parts of Europe, but also of South Africa, California, Tasmania, and New Zealand. Its teeth are equal in both jaws, of rather small size, flat, triangular, with the point directed toward the one side, and with a notch and denticulations on the shorter side. It is of a uniform slaty-gray color, and attains to a length of six feet. The female brings forth some thirty living young at one birth in May. It cannot be regarded as a very destructive fish, but becomes troublesome at times to fishermen by taking their bait and driving away other fish they desire to catch. The Hounds proper (*Mustelus*) possess a very different dentition, the teeth being small, obtuse, numerous, arranged in several rows like pavement. Five or six species are known from the shores of the various temperate and subtropical seas, one (*M. vulgaris*) being common on the coasts of Great Britain and the United States on the Pacific as well as the Atlantic side. It is of a uniform gray color or sparingly spotted with white, and attains to a length of three or four feet. The young, about twelve in number, are brought forth alive in November. It is a comparatively harmless fish, which feeds on shells, crustaceans, and decomposing animal substances.

Of the Dog-Fishes proper (*Scyllium*, *Chiloscyllium*, etc.) some twenty species are known, which are spread over nearly all the temperate and tropical seas. Their teeth are small, in several series, with a longer pointed cusp in the middle, and generally one or two smaller ones on each side. The two British species, the Lesser and the Larger Spotted Dog-Fish (*Sc. canicula* and *Sc. catulus*), belong to the most common fishes of the coast, and are often confounded with each other. But the former is finely dotted with brown above, the latter having the same parts covered with larger rounded brown spots, some of which are nearly as large as the eye. As regards size, the latter exceeds somewhat the other species, attaining to a length of four feet. Dog-fishes are used as food by the poorer classes of the Mediterranean countries, in China and Japan, and in the Orkneys, where they are dried for home consumption. The Black-mouthed Dog-Fish (*Pristiurus melanostomus*) is another European species, recognized by a series of small, flat spines with which each side of the upper edge of the caudal fin is armed. The Tiger-Shark (*Stegostoma tigrinum*) is one of the commonest and handsomest sharks in the Indian Ocean. The ground color is a brownish-yellow, and the whole fish is ornamented with black or brown transverse bands or rounded spots. It is a littoral species, but adult specimens, which are from ten to fifteen feet long, are not rarely met far from land. The genus *Crossorhinus*, of which three species are known from the coast of Australia and Japan, is remarkable as the only instance in this group of fishes in which the integuments give these inactive ground-sharks, while they lie concealed watching for their prey, what may be called a "celative" rather than a "protective" resemblance to their surroundings. The species of *Crossorhinus* grow to a length of ten feet.

The so-called Port Jackson Shark (*Cestracion*) is likewise a littoral form.

The Spiny or Piked Dog-Fish (*Acanthias*) inhabits, like the majority of the littoral genera of sharks, the temperate seas of both the northern and southern hemispheres. As expressed by the name, these fishes are distinguished from the other British littoral sharks by each of the two dorsal fins being armed in front by an acute spine. Finally, we have to notice among the littoral sharks the "Angel-Fish" or "Monk-Fish" (*Rhina squatina*). It occurs in the temperate seas of the southern as well as the northern hemisphere, and is not uncommon on sandy parts of the coast of England and Ireland. It does not seem to exceed a length of five feet, is not used as food, and is too rare to do any perceptible injury to other fish. It is said to produce about twenty young at a birth.

All pelagic sharks are of large size, and some are surpassed in bulk and length only by the larger kinds of cetaceans. Those armed with powerful cutting teeth are the most formidable tyrants of the ocean and dangerous to man, while others, which are provided with numerous but very small teeth, feed on small fishes only or marine invertebrates, and are otherwise almost harmless and of a timid disposition, which causes them to retire into the solitudes of the open sea. On this account we know very little of their life; indeed, some are known from a few individuals only which have accidentally come ashore. All pelagic sharks have a wide geographical range, and many are found in all seas within the limits of the equatorial zone—some being almost cosmopolitan. All seem to be viviparous.

The genus most abundantly represented in species and individuals is *Carcharias*. Perhaps nine-tenths of the sharks we read of in books of travel belong to this species. They attach themselves to sailing vessels, following them for weeks, thus exhibiting an endurance of muscular power scarcely found in any other class of animals. *Galeocerdo* is likewise a large shark, very dangerous to man, having the outer side of its teeth deeply notched. It occurs in the North Atlantic. Hammerhead sharks (Zygaena) strongly resemble *Carcharias*, and are equally formidable. They occur in the tropical and subtropical seas. The Porbeagles (*Lamna*) are harmless, but the *Carcharodon* is the most formidable of all sharks. The existing species (*C. rondeletii*) occurs in almost all tropical and subtropical seas, but seems to be verging toward extinction. It is known to attain a length of forty feet.

The Fox-Shark or Thresher (*Alopecias vulpes*), of which every year specimens are captured on the British coast, is also harmless.

The Basking Shark (*Selache maxima*), sometimes erroneously called "Sun-Fish," is the largest fish of the North Atlantic, growing to a length of more than thirty feet. The teeth are very small, numerous, arranged in several series, conical, and probably without use in feeding. This shark is therefore quite harmless if not attacked. On the west coast of Ireland where it is frequently seen during the summer months, generally in companies, at a distance of from three to a hundred miles off the shore, it is chased by the more courageous of the fishermen for the sake of the oil which is extracted from the liver, one fish yielding from a ton to a ton and a half.

A shark similar in many points to the basking shark (which it exceeds in size), and an inhabitant of the Indo-Pacific Ocean, is *Rhinodon typicus*. In fact, it is the largest of all sharks, as it is known to exceed a length of fifty feet, but it is stated to attain that of seventy. The captures of only a few specimens are on record, viz., one at the Cape of Good Hope, one or two near the Seychelles, where it is known as the "chagrin," one on the coast of California, and one (quite recently) on the coast of Peru.

The Greenland Shark (*Læmargus borealis*) belongs to the same family as the spiked dog-fish, but grows to a much larger size, specimens fifteen feet long being frequently met with. The Greenland shark is an inhabitant of the Arctic regions, sometimes straying to the latitudes of Great Britain and of Cape Cod in the western Atlantic. Its voracity is so great that, as Scoresby tells us, it is absolutely fearless in the presence of man while engaged in feeding on the carcass of a whale, and that it will allow itself to be stabbed with a lance or knife without being driven away.

The Spinous Shark (*Echinorhinus spinosus*) is readily recognized by the short bulky form of its body, and its short tail. More frequently in the Mediterranean, it has been found also not very rarely on the English coasts and near the Cape of Good Hope.

Distinctly bathybial species are two small dog fishes —*Spinax granulatus* from 120 fathoms, and *Scyllium canescens* from 400 fathoms, both on the southwest coast of South America; also *Centroscyllium granulatum* from 245 fathoms in the Antarctic Ocean, whose congener from the coast of Greenland probably descends to a similar depth. The sharks which reach the greatest depth recorded hitherto belong to the genus *Centrophorus*, of which some ten species are known, all from deep water in the North Atlantic, Mediterranean, the Molucca and Japanese seas. The Japanese species were discovered by the naturalists of the *Challenger* on the Hyalonema ground off Inosima in 345 fathoms. Dr. E. P. Wright found *C. cœlolepis* at a still greater depth on the coast of Portugal. The fishermen of Sétubal fish for these sharks in 400 or 500 fathoms, with a line of some 600 fathoms in length.

One of the most interesting types of the division of sharks is the small family of *Notidanidæ*, which is externally distinguished by the presence of a single dorsal fin only, without spine and opposite to the anal, and by having six or seven wide branchial openings. A member of this family has been recently discovered in Japan, and is so scarce that only two specimens are known—one in the museum at Cambridge, Mass., and the other in the British Museum. The *Notidani* are very probably ground-sharks, perhaps descending into deep water; and, although nothing positive is known at present of the habits of *Chlamydoselachus*, the fact that this singular type has escaped so long the observation of the numerous collectors in Japan renders it probable that it inhabits depths the exploration of which has been initiated only recently.

A few words have to be added with reference to the economic uses of this group of fishes. Their utility to man is insignificant in comparison with the havoc they commit among food-fishes and at fisheries, and with the loss of life which is caused by the larger kinds. An inferior kind of oil, chiefly used for the adulteration of cod-liver oil, is extracted on some of the northern fishing-stations from the liver of the spiked dog-fishes, and occasionally of the larger sharks. Cabinetmakers make extensive use of shark's skin under the name of "shagreen" for smoothing or polishing wood. This shagreen is obtained from species (such as our dog-fishes) whose skin is covered with small, pointed, closely-set, calcified papillæ, while very rough skins, in which the papillæ are large or blunt, are useless for this purpose. The dried fins of sharks (and of rays) form in India and China an important article of trade, the Chinese preparing gelatin from them, and using the better sort for culinary purposes. One of the principal places where shark fishing is practised as a profession is Kurrachee, and the principal kinds of sharks caught there are species of *Carcharias, Galeocerdo, and Zygæna.*

SHARON, a post town in Mercer county, Penn., is located on the Shenango river, seventy-five miles from Pittsburgh, and is extensively engaged in iron manufacturing and coal mining. It is the terminus of the Middlesex extension of the New York, Lake Erie and Western road, also on the Mahoning division of the same, and on the Pittsburgh and Erie road. It is the largest town in the county and is twenty-one miles from Newcastle north-northwest, fourteen miles northeast of Youngstown, Ohio, and forty-one miles southwest of Meadville. It contains three banks, one daily and one weekly paper, a high school and graded schools, seven churches, two rolling mills, two foundries and a number of hotels and stores. The population in 1880 was 5,684 and 7,447 in 1890.

SHARP, JAMES, archbishop of St. Andrews, was born in Castle Banff, Scotland, on May 4, 1618. In 1633 he went to King's College, Aberdeen, and graduated in 1637. He there studied divinity for one or two years, and probably derived his Episcopal tendencies from the "Aberdeen doctors," Aberdeen being at that time the home of Episcopal sentiment. On the outbreak of the Convenanting war he went to England (1639) and visited Oxford and perhaps Cambridge, becoming acquainted with the principal English divines. Upon his return he was chosen in 1643 through the influence of Lord Rothes to be one of the "regents" of philosophy in St. Leonard's College, St. Andrews. He appears to have continually risen in reputation, and was appointed minister of Crail in Fifeshire, on the presentation of the earl of Crawford, on January 27, 1648. His first public employment was in 1656, when he went to London on behalf of the Resolutioners to counteract with the Protector the influence of Warriston, who was acting for the Protestors. Here he became acquainted with Calamy, Ash and other leading London Presbyterian ministers, and letters passed between him and Lauderdale, then prisoner in the Tower. He displayed all his undoubted talents for petty diplomacy and considerable subtlety in argument while on this service, and his mission was decidedly successful. He returned to Scotland in 1659, but upon Monk's march to London was again, in February, 1660, sent by the Resolutioners to watch over their interests in London. He was most favorably received by Monk, who in the beginning of May despatched him to the king at Breda "to deal that he may be sent with a letter to the London Presbyterian ministers, showing his resolution to own the godly sober party." There can be little doubt that while on this mission he was finally corrupted by Charles and Clarendon, not indeed so far as to make up his mind to betray the kirk, but at any rate to decide in no way to imperil his own chances by too firm an integrity. How far he was actively a traitor in the matter had always been fairly disputed until the question was at last set at rest by the discovery of his letter, dated May 21st, from London, whither he went in April, 1661, to Middleton, the High Commissioner, from which it is proved that he was in confidential communication with Clarendon and the English bishops, and that he was earnestly and eagerly co-operating in the restoration of Episcopacy in Scotland.

The mask was at length dropped, when Episcopacy was restored, and Sharp was appointed archbishop of St. Andrews. In 1674 he was again in London. In this year also Mitchell, who had shot at him six years before, was arrested, Sharp himself having recognized him, and, upon Sharp's promise to obtain a pardon, privately made a full confession. When brought into the justiciary court, however, he refused to repeat the confession, whereupon the promise of pardon was recalled, and the prisoner was sent to the Bass. In 1678, however, the country being again in great disorder, he was tried on his own confession, which, not having been made before judges, could not legally be brought against him. This plea being overruled, he claimed the promise of pardon. Sharp, however, basely denied that any such promise had been given. His falsehood was proved by the entry of the act in the records of the court. Mitchell was finally condemned, but the condemnation was so evidently unfair and contrary to solemn promise that a reprieve would have been granted had not Sharp himself insisted on his death. This, perhaps the basest action of his base life, was speedily avenged. On May 3, 1679, as he was driving with his daughter Isabel to St. Andrews, he was set upon by nine men, who were looking for one of the instruments of his cruelty, and, in spite of unmanly beseechings and of the appeals of his daughter, was cruelly murdered. The place of the murder, on Magus Muir, now covered with fir trees, is marked by a monument erected by Dean Stanley, with a Latin inscription recording the deed.

SHARP, WILLIAM, an eminent line-engraver, was born at London on January 29, 1749. He engraved the *Doctors Disputing on the Immaculateness of the Virgin* and the *Ecce Homo of Guido Reni*, the *St. Cecilia of Domenichino*, the *Virgin and Child of Dolci* and the portrait of *John Hunter of Sir Joshua Reynolds.* His style of engraving is thoroughly masterly and original, excellent in its play of line and rendering of half-tints and of "color." He died at Chiswick on July 25, 1824.

SHAWL, a square or oblong article of dress worn in various ways dependent from the shoulders. The term is of Persian origin (*shál*), and the article itself is most characteristic and important in the dress of the natives of northwestern India and Central Asia; but in various forms, and under different names, essentially the same piece of clothing is found in most parts of the world. The Kashmir shawl is characterized by the great elaboration and minute detail of its design, in which the "cone" pattern is a prominent feature, and by the glowing harmony, brilliance, depth, and enduring qualities of its colors. The basis of these excellences is found in the raw material of the shawl manufacture, which consists of the very fine, soft, short, flossy under-wool, called pashm or pashmina, found on the shawl-goat, a variety of *Capra hircus* inhabiting the elevated regions of Tibet. A first-rate shawl weighing about seven pounds may cost at the place of its production $1,500, made up thus:—material, $150; labor, $750; duty, $350; miscellaneous expenses, $250. A large proportion of the inhabitants of Srinagar, the capital of Kashmir, are engaged in the shawl industry; and there are numerous colonies of Kashmiri weavers settled at Amritsar, Ludianah, Nurpur, and other towns in the Punjab. Amritsar is now the principal entrepôt of the shawl trade between India and Europe. Imitation Kashmir shawls are made at Lyons, Nîmes, Norwich, and Paisley, and some of the products of these localities are little inferior in beauty and elaboration to Oriental shawls; but owing to the fluctuations of fashion there has been little demand for the finer products of European looms for many years.

SHEA BUTTER. A vegetable oil.

SHEARWATER, the name of a bird first published in Willughby's *Ornithologia* (p. 252), as made known to him by Sir T. Browne, who sent a picture of it with an account that is given more fully in Ray's translation of that work (p. 334), stating that it is "a Sea-fowl, which fishermen observe to resort to their Vessels in some numbers, swimming swiftly to and fro, backward, forward, and about them, and doth as it were *radere aquam*, shear the water, from whence perhaps it had its name." Ray's mistaking young birds of this kind obtained in the Isle of Man for the young of the Coulterneb, now usually called PUFFIN, has already been mentioned under that heading. Shearwaters are found in nearly all the seas and oceans of the world, generally within no great distance from the land, though rarely resorting thereto, except in the breeding season. Four species of *Puffinus*, are recorded as visiting the coasts of the United Kingdom; but the Manx Shearwater is the only one that at all commonly occurs or breeds in the British Islands. It is a very plain-looking bird, black above and white beneath, and about the size of a pigeon. Some other species are considerably larger, while some are smaller, and of the former several are almost whole-colored, being of a sooty or dark cinereous hue both above and below. All over the world Shearwaters seem to have precisely the same habits, laying their single purely white egg in a hole under ground. The young are thickly clothed with long down, and are extremely fat. In this condition they are thought to be good eating, and enormous numbers are caught for this purpose in some localities, especially of a species, the *P. brevicaudus* of Gould, which frequents the islands off the coast of Australia, where it is commonly known as the "Mutton-bird."

SHEATHBILL, a bird so-called by Pennant in 1781 (*Gen. Birds*, ed. 2, p. 43) from the horny case which ensheaths the basal part of its bill. It was first made known from having been met with on New-Year Island, off the coast of Staten Land, where Cook anchored on New Year's eve, 1774. A few days later he discovered the islands that now bear the name of South Georgia, and there the bird was again found—in both localities frequenting the rocky shores. On his third voyage, while seeking some land reported to have been found by Kerguelen, Cook, in December, 1776, reached the cluster of desolate islands now generally known by the name of the French explorer, and here, among many other kinds of birds, was a Sheathbill, which for a long while no one suspected to be otherwise than specifically identical with that of the western Antarctic Ocean.

It is about the size of and has much the aspect of a pigeon; its plumage is pure white, its bill somewhat yellow at the base, passing into pale pink toward the tip. Round the eyes the skin is bare, and beset with cream-colored papillæ, while the legs are bluish-gray. The second or eastern species, first discriminated by Doctor Hartlaub (*Rev. Zoölogique*, 1841, p. 5; 1842, p. 402, pl. 2) as *C. minor*, is smaller in size, with plumage just as white, but having the bill and bare skin of the face black and the legs much darker. The form of the bill's "sheath" in the two species is also quite different, for in *C. alba* it is almost level throughout, while in *C. minor* it rises in front like the pommel of a saddle. Of the habits of the western and larger species not much has been recorded. It gathers its food, consisting chiefly, as Darwin and others have told us, of sea-weeds and shell-fish, on rocks at low water; but it is also known to eat birds' eggs. There is some curiously conflicting evidence as to the flavor of its flesh, some asserting that it is wholly uneatable, and others that it is palatable. Though most abundant as a shore-bird, it is frequently met with far out at sea, and its most northern recorded limit is by Fleurieu (*Voy. de Marchand*, i. p. 19), in latitude 44° S., some 260 miles from the eastern coast of Patagonia. It is not uncommon on the Falkland Isles, where it is said to breed (*Ibis*, 1861, p. 154), though confirmation of the report is as yet wanting, and from there is found at both extremities of the Strait of Magellan, and southward to Louis-Philippe Land in latitude 60° S. On the other hand, thanks to the naturalists of the British and United States expeditions to Kerguelen Land for the observation of the transit of Venus in 1874, especially Mr. Eaton (*Philos. Transactions*, clxviii. pp. 103–105) and Doctor Kidder (*Bull. U. S. National Museum*, 1875, No. 2, pp. 1–4), much more has been recorded of the eastern and smaller species, which had already been ascertained by Mr. Layard (*Proc. Zool. Society*, 1871, p. 57, pl. iv. fig. 7) to breed on the Crozet Islands, and was found to do so still more numerously on Kerguelen, while it probably frequents Prince Edward's Islands for the same purpose. The eggs, of which a considerable number have now been obtained, though of peculiar appearance, bear an unmistakable likeness to those of some plovers, while occasionally exhibiting a resemblance—of little significance, however—to those of the Tropic-birds.

The systematic position of the Sheathbills has been the subject of much hesitation—almost useless since 1836, when De Blainville (*Ann. Sc. Naturelles*, ser 2, vi. p. 97) made known certain anatomical facts proving their affinity to the Oyster-catchers though pointing also to a more distant relationship with the Gulls. The matter may now be regarded as settled forever. In 1876 Doctor Reichenow in Germany (*Jour. f. Orn.*, 1876, pp. 84–89) and in America Doctors Kidder and Coues (*Bull. U. S. Nat. Museum*, No. 3, pp. 85–116) published elaborate accounts of the anatomy of *C. minor*, the first wholly confirming the view of De Blainville, the last two agreeing with him in the main, but concluding that the Sheathbills formed a distinct group *Chionomorphæ*, in rank equal to the *Cecomorphæ* and *Charadriomorphæ* of Professor Huxley. The opinions of De Blainville and Doctor Reichenow are borne out by the observations of Mr. Eaton, (*loc. cit.*) Their differences may perhaps justify the separation of each form into what is vaguely called a "Family," but the differences will be seen by the comparative anatomist to be of slight importance, and the intimate affinity of the *Gaviæ* and *Limicolæ* already recognized by Professor Parker and some of the best taxonomers (*cf.* ORNITHOLOGY) is placed beyond dispute.

SHEBA. See YEMEN.

SHEBOYGAN, the capital of the county of the same name in Wisconsin, is located on Lake Michigan, near the mouth of the Sheboygan river, at the terminus of the Sheboygan and Western division of the Chicago and North-Western road, and on the Milwaukee, Lake Shore and Western road. The city is 50 miles north of Milwaukee, about 45 miles east of Fond du Lac, and nearly 100 miles east of Madison, the capital of the State. It is a growing, enterprising, prosperous municipality, extensively engaged in manufacturing, and otherwise contributing to swell the volume of business credited to Wisconsin yearly. The city contains ten churches, a high school, and subordinate departments of the public-school system employed throughout the northwest, two banks, one daily and four weekly papers, a court-house, a large number of stores, hotels, public halls, and places of amusement. As a manufacturing center the city is the location of many undertakings of special value, including farming implements, hollow ware, stone and enameled ware, sash, doors, blinds, and other products of the lumber industry; also tanneries, breweries, brick and plaster mills, flour mills, etc., etc. Its lake commerce is large, and the material interests of the city are well developed and sustained. The population in 1890 was 16,385.

SHECHEM, now NÁBULUS, a city of Palestine. The Vale of Shechem or Nábulus is in fact an easy pass between the Mediterranean and Jordan basins, and at the watershed (1,870 feet), where the city stands, one and one-quarter miles from Jacob's Well, is not more than 100 yards wide. The name Shechem (shoulder, back) accords with the position of the town on the watershed, and the native name in Josephus' time (Mabortha, *B. J.*, iv. 8, 1; Pliny has Mamortha) means simply "the pass." The situation of Shechem must have given it importance at a very early date, and it is still a busy town of 20,000 inhabitants, with soap manufactures and considerable trade. On the other hand, the position is equally favorable for brigandage, to which, under weak governments, the Shechemites were addicted of old (Judges ix. 25; Hosea vi. 9, where "for consent" read "to Shechem"), and the district is still a lawless one.

The ancient inhabitants of Shechem were the Bne Hamor, a Canaanite clan, who were not expelled on the first conquest of Canaan, but remained in possession till the events recorded in Judges ix. From the narrative of Gen. xxxiv., which has been spoken of in the article LEVI, it would seem that they entered into friendly relations with the invaders, and that an attack made on them by Simeon and Levi was repudiated by Israel and led to the dispersion of these two tribes. In Judges ix. the "freemen of Shechem" (בעלי שכם) appear as a turbulent but cowardly race, who, in spite of their numbers and wealth, had become vassals of Gideon for the sake of protection against the Midianites, and would have continued to serve his sons but for the enterprise of Abimelech, whose mother was of their race. With the aid of mercenaries hired with the treasure of the sanctuary of Baal-Berith or El-Berith, the god of the town, Abimelech destroyed the sons of Gideon, was crowned king of Shechem, and for three years held sway also over the surrounding Israelites. A revolt was led by Gaal, an Israelite who scorned to be subject to the creature of the despised Canaanites, and, the Shechemites having fallen out with Abimelech about their practice of brigandage, Gaal made a dash at the city in the absence of the king, and the fickle inhabitants received him with open arms. Abimelech, however, with his mercenaries proved too strong for his adversaries, and Canaanite Shechem was utterly destroyed. Its place was taken by a Hebrew city, and the Canaanite sanctuary of El-Berith was transformed into a Hebrew holy place of El the God of Israel, of which the foundation was afterward referred to Jacob (Gen. xxxiii. 20) or even to Abraham (Gen. xii. 7). The great stone under the famous sacred tree at the sanctuary (the "tree of the revealer" or "tree of the soothsayers," E.V. "plain of Moreh" or "of Meonenim;" Gen. xii. 6, xxxv. 4; Deut. xi. 30; Jud. ix. 6, 37) was said to have been set up by Joshua (Josh. xxiv. 26), and Joseph's grave was shown there. All this indicates that Shechem was once the chief sanctuary of Joseph, and so we understand why Rehoboam went to Shechem to be crowned king of Northern Israel and why Jeroboam at first made it his residence (1 Kings xii. 25). Politically Shechem was soon supplanted by Tirzah and Samaria, but it appears to have been still a sanctuary in the time of Hosea. It survived the fall of Ephraim (Jer. xli. 5) and ultimately became the religious center of the SAMARITANS, (*q.v.*) The Greek name Neapolis, known to Josephus, indicates the building of a new town, which, according to Eusebius and Jerome, was a little way from the old Shechem, or at least did not include the traditional holy sites. Neapolis was the birthplace of Justin Martyr, and became the seat of a bishopric. Five Christian churches destroyed by the Samaritans in the time of Anastasius were rebuilt by Justinian (Procop., *De Æd.*, v. 7). Remains of one of these seem still to exist in the crusaders' church of the Passion and Resurrection (1167), now the great mosque. Neapolis had much to suffer in the crusades; it was finally lost to the Christians soon after Saladin's great victory at Hittín.

SHEE, SIR MARTIN ARCHER, portrait-painter, and president of the Royal Academy, was born in Dublin December 23, 1770. Young Shee became a student of art in the Dublin Society, and came early to London, where he was, in 1788, introduced by Burke to Reynolds, by whose advice he studied in the schools of the Royal Academy. In 1789 he exhibited his first two pictures, the *Head of an Old Man* and *Portrait of a Gentleman*. He was chosen an associate of the Royal Academy in 1798, shortly after the illustrious Flaxman, and in 1800 he was made a Royal Academician. In addition to his portraits he executed various subjects and historical works, such as *Lavinia*, *Belisarius*, his diploma picture *Prospero and Miranda*, and the *Daughter of Jephthah*. In 1805 he published a poem consisting of *Rhymes on Art*, and it was succeeded by a second part in 1809. Shee published another small volume of verses in 1814, entitled *The Commemoration of Sir Joshua Reynolds, and other Poems*, but this effort did not greatly increase his fame. He now produced a tragedy called *Alasco*, of which the scene was laid in Poland. The play was accepted at Covent Garden, but Colman, the licenser, refused it his sanction, on the plea of its containing certain treasonable allusions, and Shee, in great wrath, resolved to make his appeal to the public. This violent threat he carried out in 1824, but unfortunately the public found other business to mind, and *Alasco* is still on the list of unacted dramas. On the death of Lawrence in 1830, Shee was chosen president of the Royal Academy, and shortly afterward he received the honor of knighthood. He continued to paint till 1845, and died August 13, 1850, in his eightieth year.

SHEEP. The animals commonly designated by this name constitute the genus *Ovis* of zoölogists, a group belonging to the Artiodactyle or paired-toed section of the *Ungulata* or hoofed mammals (see MAMMALIA). They are ruminants, and belong to the hollow-horned section, *i.e.*, those having persistent horns composed of conical epidermic sheaths, encasing and supported by processes of the frontal bone.

In nearly all wild sheep the horns are present in both sexes, though smaller in the female. They are trigonal in section, having always three more or less distinctly marked surfaces, divided by edges running longitudinally to the axis of the horn, sometimes sharply prominent and sometimes rounded off. They are also marked by numerous transverse ridges and constrictions, and present a strong more or less spiral curve, which varies in direction in different species. The teeth resemble generally those of the other *Bovidæ*. In the feet the hoofs of the two middle toes (third and fourth) only reach the ground, and are equally developed. The outer toes (second and fifth) are very rudimentary, represented only by small hoofs, without bony phalanges, and by the proximal or upper ends of the slender splint-like metacarpal or metatarsal bones. Between the two middle toes, in most species, is lodged a deep sac, having the form of a retort and with a small external orifice, which secretes an unctuous and odorous substance. The crumen or suborbital gland, which is so largely developed in some antelopes and deer, is present, but in a comparatively rudimentary form, though varying in different species. The tail, though long in many varieties of domestic sheep, is short in all the wild species, in which also the external covering of the body is in the main hairy—the fine fleecy coats of wool, or hair so modified as to have the property of "felting," having been specially cultivated by selective breeding.

The sheep was a domestic animal in Asia and Europe before the dawn of history, though quite unknown as such in the New World until after the Spanish conquest. It has now been introduced by man into almost all parts of the world where settled agricultural operations are carried on, but flourishes especially in the temperate regions of both hemispheres. The variations of external characters seen in the different domestic breeds are very great. They are chiefly manifested in the form and number of the horns, which may be increased from the normal two to four or even eight, or may be altogether absent in the female alone or in both sexes; in the form and length of the ears, which often hang pendant by the side of the head; in the peculiar elevation or arching of the nasal bones in some Eastern races; in the length of the tail, and the development of great masses of fat at each side of its root or in the tail itself; and in the color and quality of the fleece. (See AGRICULTURE.)

The geographical distribution of wild sheep is interesting. The immense mountain ranges of Central Asia, the Pamir and Thian Shan of Turkestan, may be looked upon as the center of their habitat. Here, at an elevation of 16,000 feet above the sea-level, is the home of the magnificent *Ovis poli*, named after the celebrated Venetian traveler, Marco Polo, who met with it in his adventurous travels through this region in the thirteenth century. It is remarkable for the great size of the horns of the old rams and the wide open sweep of their curve, so that the points stand boldly out on each side, far away from the animal's head, instead of curling round nearly in the same plane, as in most of the allied species. A very similar if not identical species from the same origin, in which the horns retain their more normal development, has received the name of *O. karelini*. Eastward and northward is found the argali (*O. ammon*). Still further north, in the Stanovoi mountains and Kamchatka, is *O. nivicola*, and away on the other side of Behring's Strait, in the Rocky mountains and adjacent high lands of western North America, is the "bighorn" or mountain sheep (*O. montana*), the only one of the genus found in this continent and indeed the only hollow-horned ruminant, being, like the rest, obviously a straggler from the cradle of its race. Turning southward in Nepal and Little Tibet, is *O. hodgsoni*, a species with large and strongly curved horns, and another with smaller and more spreading horns, the burrhel, *O. nahoor*. Passing in a southwesterly direction we find a series of smaller forms, *O. vignei* of Ladak, *O. cycloceros* of northern India, Persia, and Baluchistan, *O. gmelini* of Asia Minor, *O. ophion*, confined to the elevated pine-clad Troodos mountains of the island of Cyprus, and *O. musimon*, the moufflon of Corsica and Sardinia, believed to have been formerly also a native of Spain. Lastly, we have the somewhat aberrant, goat-like aoudad, *O. tragelaphus*, of the great mountain ranges of North Africa.

We thus find that sheep are essentially inhabitants of high mountainous parts of the world, for dwelling among which their wonderful powers of climbing and leaping give them special advantages. No species frequent by choice either level deserts, open plains, dense forests, or swamps. By far the greater number of species are inhabitants of the continent of Asia, one or perhaps two extending into North America, one into Southern Europe, and one into North Africa. No wild sheep occurs in any other part of the world, unless the so called musk-ox (*Ovibos moschatus*) of the Arctic regions, the nearest existing ally to the true sheep, may be considered as one. They are apparently not indigenous in the British Isles, but were probably introduced by man from the East in prehistoric times.

SHEEPSHEAD is the name of one of the largest species of the genus *Sargus*, marine fishes known on the coasts of southern Europe as "sargo" or "saragu." These fishes possess two kinds of teeth—one broad and flat like incisors, occupying in a single series the front of the jaws; the other, semiglobular and molar-like, arranged in several series on the sides of the jaws. The sheepshead, *Sargus ovis*, occurs in abundance on the Atlantic coasts of the United States, from Cape Cod to Florida, and is one of the most valued food-fishes of North America. It is said to attain to a length of thirty inches and a weight of fifteen pounds. Its food consists of shellfish. It may be distinguished from some other allied species occurring in the same seas by the presence of seven or eight dark crossbands traversing the body, by a recumbent spine in front of the dorsal fin, by twelve spines and as many rays of the dorsal and ten rays of the anal fin, and by forty-six scales along the lateral line. The term "sheepshead" is also given in some parts of North America to a very different fish, a freshwater Sciænoid, *Corvina oscula*, which is much less esteemed for the table.

SHEERNESS-ON-SEA, a seaport, watering-place, naval establishment, and garrison town in the Isle of Sheppey, Kent, is situated on the Thames at the mouth of the Medway, on the Sittingbourne branch of the London, Chatham, and Dover railway, fifty-two miles east of London, and seventeen northeast of Maidstone. The older part of Sheerness, containing the dockyard, is called Blue Town, the later additions being known as Miletown, Bankstown, and Marinetown. The dockyard is sixty acres in extent, and contains naval barracks with accommodation for 1,000 men. The fortifications are now of great strength, $500,000 having been spent in adapting them to modern necessities. The town is in the parish of Minster, which possesses the most ancient abbey church in England. The population of the urban sanitary district (area 938 acres) in 1871 was 13,956, in 1881 it was 14,286, and in 1890 (estimated) 16,500.

SHEFFIELD, a municipal and parliamentary borough in the West Riding of Yorkshire, England, next to Leeds the largest town in the county, and the chief seat of the cutlery trade in England, is situated on somewhat hilly ground in the neighborhood of the Pennine range, on several rivers and streams, the principal of which are the Don, the Sheaf, the Porter, the Rivelin, and the Loxley, and on the Midland, Great Northern, and various branch railway lines, 39 miles south of Leeds, 37 southeast of Manchester, 172 north of London by the Midland railway, and 162 by the Great Northern. The borough of Sheffield embraces a district ten miles in length by three or four miles in breadth. It includes the townships of Sheffield, Brightside Bierlow, Attercliffe-cum-Darnall, Nether Hallam, Heeley, Ecclesall Bierlow and Upper Hallam, the last two districts being in great part rural, but occupied also by the southern and western suburbs of the borough. Portions of the town are somewhat irregularly built, and the only ecclesiastical building of special interest is the old parish church of St. Peter, chiefly in the Perpendicular style, originally cruciform, but by various additions now rectangular. The old Norman building is supposed to have been burned down during the wars of Edward III. with the barons, and the most ancient part of the present structure is the tower, dating from the fourteenth century.

The free grammar school was founded in 1603 through a bequest of Thomas Smith, a native of Sheffield. The grammar school building of stone in the Tudor style, erected in 1824, is now used as a technical school, the grammar school trustees having purchased the collegiate school at Broomhall Park. The other principal educational institutions are the free writing school (1715, rebuilt in 1827), the boys' charity school (founded 1706), the girls' charity school (1786), the Roman Catholic reformatory (1861), the Church of England educational institute, the Firth college, erected by Mark Firth at a cost of $100,000, for lectures and classes in connection with the extension of university education, the Wesley college, associated with London university, Ranmoor college, for training young men for the ministry in the Methodist New Connexion, the mechanics' institute, the school of art, and the St. George's museum, founded by Mr. Ruskin, and including a picture gallery, a library, and a mineral, a natural history, and a botanical collection, the special purpose of the institution being the training of art students.

The principal public buildings are the town-hall, including the police offices and rooms for the quarter sessions and other courts, erected in 1808, enlarged in 1833, and lately extensively remodeled at a cost of over $50,000; the council hall and municipal buildings, originally used for the mechanics' institute, but purchased by the corporation in 1864; the cutlers' hall, built in 1832 at a cost of $32,500, and enlarged in 1857 by the addition of a magnificent banqueting hall, erected at a cost of $45,000; the general post-office, in the Doric style, opened in 1874; the fine new corn exchange, in the Tudor style, erected at a cost of $300,000; the Albert Hall, opened in 1873; the music hall, erected in 1823; the freemasons' hall, opened in 1877; the temperance halls, 1856; the Norfolk market hall, opened in 1857 at a cost of $200,000; the theater royal, originally erected in 1793, rebuilt in 1880; the Alexandra theater, erected 1836-7; the barracks, having accommodation for a cavalry and an infantry regiment and surrounded by grounds twenty-five acres in extent; and the volunteer artillery drill hall. The literary and social institutions include the Athenæum, established in 1847, with a newsroom and library; the literary and philosophical society, 1822; the Sheffield club, 1862; the Sheffield library, commenced in 1777, and containing 80,000 volumes; and the free library, founded in 1856, with various branches opened in subsequent years. Among the medical or benevolent institutions may by mentioned the general infirmary, opened in 1797; the public hospital, erected in 1858 (in connection with the Sheffield medical school established in 1792) and extended in 1869; the hospital for women, originally established in 1864, but transferred in 1878 to a new building erected at the expense of Thomas Jessop, and now called the Jessop hospital for women; the hospital for diseases of the skin, 1880; the ear and throat hospital, 1880; the fever hospital erected by the Town Council at a cost of about $125,000; the school and manufactory for the blind, 1879; the South Yorkshire lunatic asylum, 1872; the Shrewsbury hospital, originally founded by the seventh earl of Shrewsbury, who died in 1616, but since greatly enlarged by successive benefactions; the Hollis hospital, established in 1700 for widows of cutlers, etc.; the Firth almshouses, erected and endowed in 1869 by Mark Firth of Oakbrook at a cost of $150,000; the licensed victuallers' asylum, 1878; the Deakin institution, 1849; Hanby's charity, 1766; and Hadfield's charity, 1860.

The public monuments are neither numerous nor important, the principal being the Montgomery statue, erected to James Montgomery the poet in 1861, chiefly by the Sunday-school teachers of the town; the Ebenezer

Elliot monument, erected in the market-place in 1854, and removed to Weston Park in 1875; the column to Godfrey Sykes the artist, erected in Weston Park in 1871; the cholera monument 1834–5, and the Crimean monument to the natives of Sheffield who died in the Crimean War.

The town is comparatively well supplied with parks and public gardens.

The prosperity of Sheffield is chiefly dependent on the manufacture of steel and the application of it to its various uses. The smelting of iron in the district is supposed to date from Roman times, and there is distinct proof carrying it back as far as the Norman Conquest. The town had become famed for its cutlery by the fourteenth century, as is shown by allusions in Chaucer. In early times cutlery was made of blister or bar steel; afterward shear steel was introduced for the same purpose; but in 1740 Benjamin Huntsman of Handsworth introduced the manufacture of cast steel, and up to the present time Sheffield retains its supremacy in steel manufacture, notwithstanding foreign competition, especially that of Germany and the United States, its trade in heavy steel having kept pace with that in the other branches. It was with the aid of Sheffield capital that Henry Bessemer founded his pioneer works to develop the manufacture of his invention, and a large quantity of Bessemer steel is still made in Sheffield. The heavy branch of the steel manufacture includes armor plates, rails, tires, axles, large castings for engines, steel shot, and steel for rifles. The cutlery trade embraces almost every variety of instrument and tool—spring and table knives, razors, scissors, surgical instruments, mathematical instruments, edge tools, saws, scythes, sickles, spades, shovels, engineering tools, hammers, vises, etc. The manufacture of engines and machinery is also largely carried on, as well as that of stoves and grates. The art of silver plating was introduced by Thomas Bolsover in 1742, and the manufacture is still of importance. Among the minor industries of the town are tanning, confectionery, cabinet-making, bicycle-making, iron and brass founding, silver refining, and the manufacture of brushes and combs and of optical instruments. Sheffield obtained municipal government in 1843, and is divided into nine wards. The number of aldermen is sixteen. The town first returned members to parliament in 1832. In 1885 the representation was increased from two to five members, the parliamentary divisions being Attercliff, Brightside, Central, Ecclesall, and Hallam. The area of the municipal and parliamentary borough is 19,651 acres. From 45,755 in 1801 the population had increased by 1841 to 110,891, by 1871 to 239,947, by 1881 to 284,508 (141,298 males, 143,210 females), and by 1889 to 327,227.

SHEFFIELD, John. See Buckinghamshire, Duke of.

SHEIL, Richard Lalor, Irish political orator, was the eldest son of Edward Sheil, an Irishman who had acquired considerable wealth in Spain, and after the passing of the Act permitting Catholics in Ireland to purchase and transmit property in fee had returned to Ireland, where he purchased the estate of Bellevue, Tipperary. The son was born August 17, 1791, at Drumdowney, Tipperary. He received instruction in French and Latin from the Abbé de Grimeau, a French refugee, and afterward at Kensington House school, London, presided over by a French nobleman, the Prince de Broglie. In November, 1807, he entered Trinity College, Dublin, where he specially distinguished himself in the debates of the Historical Society. He was admitted a member of the Irish bar at the Hilary term, 1814, and meanwhile resolved to support himself by writing plays. His play of *Adelaide, or the Emigrants*, was played at the Crow street theater, Dublin, February 19, 1814, with complete success, and on May 23, 1816, was performed at Covent Garden. The *Apostate*, produced at the latter theater on May 3, 1817, firmly established his reputation, and encouraged him to continue his dramatic efforts till his legal and political duties absorbed the greater part of his leisure. His principal other plays are *Bellamira* (written in 1818), *Evadne* (1819), *Huguenot*, (1819), and *Montini* (1820). In 1822 he began, along with W. H. Curran, to contribute to the *New Monthly Magazine* a series of papers entitled *Sketches of the Irish Bar*, which attracted considerable attention by their raciness and graphic vigor. After the defeat of the Catholic Relief Bill in 1825 he, along with O'Connell, was the principal leader of the agitation persistently carried on till Catholic emancipation was granted in 1829. In the same year he was returned to parliament for Melbourne Port, and in 1831 for Louth. He took a prominent part in all the debates relating to Ireland, and his brilliant eloquence gradually captivated the admiration of the House. In August, 1839 he became vice-president of the board of trade in Lord Melbourne's ministry. After the accession of Lord John Russell to power in 1846 he was appointed master of the mint. He died somewhat suddenly of gout at Florence on May 23, 1851.

SHEKEL. In the system of Babylonian and Assyrian weights the talent (called in Heb. כִּכָּר, kikkar) consisted of sixty mana (Heb. מָנֶה, maneh) or minas, and the latter again of sixty shekels (Heb. שֶׁקֶל). For the values of these weights see Numismatics. The silver shekels of the Maccabees (Numismatics), have a maximum weight of about 224 grains, and correspond to the Phœnician tetradrachm (four drams). Hence in Matt. xvii. 24 the temple tax of half a shekel is called the didrachm (two drams). In 2 Sam. xiv. 26 we read of shekels "after the king's weight," *i.e.*, according to the Assyrian standard, which is called "royal" on weights found at Nineveh. The Hebrews divided the shekel into twenty parts, each of which was a gerah (גֵּרָה).

SHELBURNE, Earl of. See Lansdowne, Marquis of.

SHELBYVILLE, a city of Indiana and capital of Shelby county, is located in Addison township on the Indianapolis, Cincinnati and Lafayette railroad, at the Columbus and Rushville crossing, twenty-seven miles southeast of Indianapolis. The surrounding country is largely agricultural and to some extent manufacturing. Much of it is underlaid with bituminous coal, and along the creeks and rivers a considerable growth of hard and soft wood timbers is to be found. As a result the city is the receiving and distributing point for the trade of a populous and productive section, and the annual trade, already large, is constantly increasing. The public improvements consist of the court-house, a high school, eight churches, two banks, and several hotels. There are three weekly and three daily papers published, a furniture factory and planing mill in operation, and other industries of a comparatively minor character. Population, 1890, 5,449.

SHELD-DRAKE, or, as commonly spelt in its contracted form, Sheldrake, one of the most conspicuous birds of the Duck tribe, *Anatidæ*, called, however, in many parts of England the "Burrow-Duck" from its habits, and in some districts by the almost obsolete name of "Bergander" (Dutch, *Berg-eende*, Germ. *Berg-ente*), a word used by Turner in 1544.

The Sheldrake is the *Anas tadorna* of Linnæus, and the *Tadorna cornuta* or *T. vulpanser* of modern ornithology, a bird somewhat larger and of more upright stature than an ordinary duck, having its bill, with a basal fleshy protuberance (whence the specific term *cornuta*), pale red, the head and upper neck very dark glossy green, and beneath that a broad white collar, succeeded by a still broader belt of bright bay extending from the upper back across the upper breast. The outer scapulars, the primaries, a median abdominal stripe, which dilates at the vent, and a bar at the tip of the middle tail-quills are black; the inner secondaries and the lower tail-coverts are gray; and the *speculum* or wing-spot is a rich bronzed-green. The rest of the plumage is pure white, and the legs are flesh-colored. There is little external difference between the sexes, the female being only somewhat smaller and less brightly colored. The Sheldrake frequents the sandy coasts of nearly the whole of Europe and North Africa, extending across Asia to India, China, and Japan, generally keeping in pairs and sometimes penetrating to favorable inland localities. The nest is always made under cover, usually in a rabbit-hole among sand-hills, and in the Frisian Islands the people supply this bird with artificial burrows, taking large toll of it in eggs and down. Barbary, southeastern Europe, and Central Asia are inhabited by an allied species of more inland range and very different coloration, the *T. casarca* or *Casarca rutila* of ornithologists, the Ruddy Sheldrake of English authors—for it has several times strayed to the British Islands—and the "Brahminy Duck" of Anglo-Indians, who find it resorting in winter, whether by pairs or by thousands, to their inland waters. This species is of an almost uniform bay color all over, except the quill-feathers of the wings and tail, and (in the male) a ring round the neck, which are black, while the wing-coverts are white and the *speculum* shines with green and purple; the bill and legs are dark-colored. A species closely resembling the last, but with a gray head, *T. cana*, inhabits South Africa, while in some of the islands of the Malay Archipelago, and in the northern parts of Australia, there is a fourth species, *T. radjah*, which almost equals the true Sheldrake in its brightly contrasted plumage, but yet wants some of the lively colors the latter displays—its head, for instance, being white instead of dark green. Further to the southward in Australia occurs another species of more somber colors, the *T. tadornoides;* and New Zealand is the home of a sixth species, *T. variegata*, still less distinguished by bright hues. In the last two the plumage of the sexes differs not inconsiderably, but all are believed to have essentially the same habits as the *T. cornuta*.

Sheldrakes will, if attention be paid to their wants, breed freely in captivity, crossing if opportunity be given them with other species.

The genus *Tadorna*, as shown by its tracheal character, seems to be most nearly related to *Chenalopex*, containing the bird so well known as the Egyptian Goose, *C. ægyptiaca*, and an allied species, *C. jubata*, from South America. For the same reason the genus *Plectropterus*, composed of the Spur-winged Geese of Africa, and perhaps the Australian *Anseranas* and the Indian and Ethiopian *Sarcidornis*, also appear to belong to the same group, which should be reckoned rather to the Anatine than to the Anserine section of the *Anatidæ*.

SHELLEY, Mary Wollstonecraft, the second wife of the poet Shelley (*q.v.*), was born in London, August 30, 1797. When she was in Switzerland with Shelley and Byron in 1816 (see below), a proposal was made that various members of the party should write a romance or tale dealing with the supernatural. The result of this project was that Mrs. Shelley wrote *Frankenstein*, published in 1818, Byron the beginning of a narrative about a vampyre, and Doctor Polidori, Byron's physician, a tale named *The Vampyre*, the authorship of which used frequently in past years to be attributed to Byron himself. This romance was followed by others: *Valperga, or the Life and Adventures of Castruccio, Prince of Lucca* (1823), an historical tale written with a good deal of spirit, and readable enough even now; *The Last Man* (1826), a fiction of the final agonies of human society owing to the universal spread of a pestilence. *The Fortunes of Perkin Warbeck* (1830); *Lodore* (1835); and *Falkner* (1837). Besides these novels there was the *Journal of a Six Weeks' Tour*, which is published in conjunction with Shelley's prose-writings; also *Rambles in Germany and Italy* in 1840–42–43. After the death of Shelley, for whom she had a deep and even enthusiastic affection, marred at times by defects of temper, Mrs. Shelley in the autumn of 1823 returned to London. She was a loving and careful mother, and shared the prosperous fortunes of her son, when, upon the death of Sir Timothy Shelley in 1844, he succeeded to the baronetcy. She died in February, 1851.

SHELLEY, Percy Bysshe, was born August 4, 1792, at Field Place, near Horsham, Sussex, England. He was the oldest child of Timothy Shelley, M. P. for Shoreham, by his wife Elizabeth, daughter of Charles Pilfold, of Effingham, Surrey. At the age of six he was sent to a day school at Warnham, kept by the Rev. Mr. Edwards; at ten to Sion House School, Brentford, of which the principal was Doctor Greenlaw, while the pupils were mostly sons of local tradesmen; at twelve (or immediately before that age, July 29, 1804) to Eton. Shelley was a shy, sensitive, mopish sort of a boy, by nature gentle, kindly, and retiring—under provocation dangerously violent.

Shelley entered University College, Oxford, in April, 1810, returned thence to Eton, and finally quitted the school at midsummer, and commenced residence in Oxford in October. Here he met a young Durham man, Thomas Jefferson Hogg, who had preceded him in the university by a couple of months; the two youths at once struck up a warm and intimate friendship. Shelley had at this time a love for chemical experiment, as well as for poetry, philosophy, and classical study, and was in all his tastes and bearing an enthusiast. Hogg was not in the least an enthusiast, rather a cynic, but he also was a steady and well-read classical student. In religious matters both were skeptics, or indeed, decided anti-Christians; whether Hogg, as the senior and more informed disputant, pioneered Shelley into strict atheism, or whether Shelley, as the more impassioned and unflinching speculator, outran the easy-going jeering Hogg, is a moot point; we incline to the latter opinion. Certain it is that each egged on the other by perpetual disquisition on abstruse subjects, conducted partly for the sake of truth and partly for that of mental exercitation, without on either side any disposition to bow to authority or stop short of extreme conclusions. The upshot of this habit was that Shelley and Hogg, at the close of some five months of happy and uneventful academic life, got expelled from the university.

Shelley and Hogg came up to London, where Shelley was soon left alone, as his friend went to York to study conveyancing. Percy and his incensed father did not at once come to terms, and for a while he had no resource beyond pocket-money saved up by his sisters (four in number altogether), and sent round to him, sometimes by the hand of a singularly pretty school-fellow, Miss Harriet Westbrook, daughter of a retired and moderately opulent hotel-keeper. He cultivated the society of Harriet, calling at the house of her father, and being encouraged in his assiduity by her much older sister, Eliza. Harriet not unnaturally fell in love with him; and he, though not it would seem at any time ardently in love with her, dallied along the flowery pathway which leads to sentiment and a definite courtship. After a while Percy was reconciled to his father, revisited his family in Sussex, and then stayed with a cousin in Wales. Hence he was recalled to London by Miss Harriet Westbrook, who wrote complaining of her father's resolve to send her back to her school, in which she was now regarded with repulsion as having become too apt a pupil of the atheist Shelley. He replied counseling resistance. "She wrote to say" (these are the words of Shelley in a letter to Hogg, dating toward the end of July, 1811) "that resistance was useless, but that she would fly with me, and threw herself upon my protection." Shelley therefore returned to London, where he found Harriet agitated and wavering; finally they agreed to elope, traveled in haste to Edinburgh, and there, according to the law of Scotland, became husband and wife on August 28th.

Harriet Shelley was not only beautiful; she was amiable, accommodating, adequately well educated and well bred. She liked reading, and her reading was not strictly frivolous. But she could not (as Shelley said at a later date) "feel poetry and understand philosophy." For nearly three years Shelley and she led a shifting sort of life upon an income of $2,000 a year, one-half of which was allowed (after his first severe indignation at the *mésalliance* was past) by Mr. Timothy Shelley, and the other half by Mr. Westbrook.

The spouses left Edinburg for York, thence moved to Keswick, in Cumberland, whence they sailed to Dublin, crossed to Wales, where they resided at Naub-Gwillt, then at Lynmouth, in Devonshire, finally at Tanyrallt, in Carnarvonshire. At Lynmouth an Irish servant of Shelley was arrested for posting up a *Declaration of Rights*, composed by the youthful reformer, and some verses of his named *The Devil's Walk*. At Tanyrallt Shelley was, according to his own account, confirmed by the evidence of his wife and Miss Westbrook, her elder sister, attacked by assassins, who fired three shots at him. This broke up their residence at Tanyrallt, and, after revisiting Ireland, they settled in London, where a daughter, Ianthe Eliza Shelley, was born to them, and where Shelley brought out his first poem of any importance, *Queen Mab*. It was privately printed, as its exceedingly aggressive tone in matters of religion and morals would not allow of publication.

The speculative sage whom Shelley especially reverenced was William Godwin, the author of *Political Justice* and of the romance *Caleb Williams;* in 1796 he had married Mary Wollstonecraft, authoress of *The Rights of Woman*, who died shortly after giving birth, on August 30, 1797, to a daughter Mary. With Godwin Shelley had opened a volunteered correspondence late in 1811, and he had known him personally since the winter which closed 1812. Godwin was then a bookseller, living with his second wife, who had been a Mrs. Clairmont; there were four other inmates of the household, two of whom call for some mention here—Fanny Wollstonecraft, the daughter of the authoress and Mr. Imlay, and Claire, the daughter of Mrs. Clairmont. Fanny committed suicide in October, 1816, being, according to some accounts which remain unverified, hopelessly in love with Shelley; Claire was closely associated with all his subsequent career. It was toward May, 1814, that Shelley first saw Mary Wollstonecraft Godwin as a grown-up girl (she was well on toward seventeen); he instantly fell in love with her, and she with him. Just before this, March 24, Shelley had remarried Harriet in London, though with no obviously cogent motive for doing so; but, on becoming enamored of Mary, he seems to have rapidly made up his mind that Harriet should not stand in the way. The upshot came on July 28th, when Shelley aided Mary to elope from her father's house, Claire Clairmont deciding to accompany them. They crossed to Calais, and proceeded across France into Switzerland.

The three young people returned to London in September. In the following January Sir Bysshe Shelley died, and Percy became the immediate heir to the entailed property inherited by his father, Sir Timothy. This entailed property seems to have been worth $30,000 per annum, or little less. There was another very much larger property which Percy might shortly before have secured to himself, contingently upon his father's death, if he would have consented to put it upon the same footing of entail; but this he resolutely refused to do, on the professed ground of his being opposed upon principle to the system of entail. He now came to an understanding with his father as to the remaining entailed property; and, giving up certain future advantages, he received henceforth a regular income of $5,000 a year. Out of this he assigned $1,000 a year to Harriet, who had given birth in November to a son, Charles Bysshe (he died in 1826). Shelley, and Mary as well, were on moderately good terms with Harriet, seeing her from time to time. Shelley and Mary (who was naturally always called Mrs. Shelley) now settled at Bishopgate, near Windsor Forest; here he produced his first excellent poem, *Alastor, or the Spirit of Solitude*, which was published soon afterward along with a few others. In May, 1816, the pair left England for Switzerland, together with Miss Clairmont, and their own infant son William. They went straight to Sécheron, near Geneva; Lord Byron, whose separation from his wife had just then taken place, arrived there immediately afterward. A great deal of controversy has lately arisen as to the motives and incidents of this foreign sojourn. The clear fact is that Miss Clairmont, who had a fine voice and some inclination for the stage, had seen Byron, as connected with the management of Drury Lane theater, early in the year, and an amorous intrigue had begun between them in London. The three returned to London in September, 1816, Byron remaining abroad; and in January, 1817, Miss Clairmont gave birth to his daughter named Allegra. The return of the Shelleys was closely followed by two suicides—first that of Fanny Wollstonecraft, and second that of Harriet Shelley, who on November 9th drowned herself in the Serpentine.

The death of Harriet having removed the only obstacle to a marriage with Mary Godwin, the wedding ensued on December 30, 1816, and the married couple settled down at Great Marlow in Buckinghamshire. Their tranquillity was shortly disturbed by a Chancery suit set in motion by Mr. Westbrook, who asked for the custody of his two grandchildren, on the ground that Shelley had deserted his wife and intended to bring up his offspring in his own atheistic and anti-social opinions. Lord Chancellor Eldon delivered judgment toward March 26, 1817. He held that Shelley, having avowed condemnable principles of conduct, and having fashioned his own conduct to correspond, and being likely to inculcate the same principles upon his children, was unfit to have the charge of them. He therefore assigned this charge to Mr. and Miss Westbrook, and appointed as their immediate curator Doctor Hume, an orthodox army-physician, who was Shelley's own nominee.

This is the last incident of marked importance in the perturbed career of Shelley; the rest relates to the history of his mind, the poems which he produced and published, and his changes of locality in traveling. In

March, 1818, Shelley, with his wife, their two infants, William and Clara, and Miss Clairmont and her baby Allegra, went off to Italy, in which country the whole short remainder of his life was passed. Allegra was soon sent on to Venice, to her father, Byron, who, ever since parting from Miss Clairmont in Switzerland, showed a callous and unfeeling determination to see and know no more about her. In 1818 the Shelleys—mostly, not always, with Miss Clairmont in their company—were in Milan, Leghorn, the Bagni di Lucca, Venice and its neighborhood, Rome, and Naples; in 1819 in Rome, the vicinity of Leghorn, and Florence (both their infants were now dead, but a third was born late in 1819, the late baronet, Sir Percy Florence Shelley); in 1820 in Pisa, the Bagni di Pisa (or di San Giuliano), and Leghorn; in 1821 in Pisa, and with Byron in Ravenna; in 1822 in Pisa and on the Bay of Spezia, between Lerici and San Terenzio. In Pisa, Byron and Shelley were very constantly together, having in their company at one time or another Captain Medwin (cousin and schoolfellow of Shelley, and one of his biographers), Lieutenant and Mrs. Williams, to both of whom the poet was very warmly attached, and Captain Trelawny, the adventurous and romantic-natured seaman who has left important and interesting reminiscences of this period. In Pisa he knew also Prince Alexander Mavrocordato, one of the pioneers of Grecian insurrection and freedom; the glorious cause fired Shelley, and he wrote the drama of *Hellas* (1821).

The last residence of Shelley was the Casa Magni, a bare and exposed dwelling on the Gulf of Spezia. He and his wife, with the Williamses, went there at the end of April, 1822, to spend the summer, which proved an arid and scorching one. Shelley and Williams, both of them insatiably fond of boating, had a small schooner named the *Don Juan* built at Genoa after a design which Williams had procured from a naval friend, and which was the reverse of safe. They received her on May 12th, found her rapid and alert, and on July 1st started in her to Leghorn, to meet Leigh Hunt, whose arrival in Italy had just been notified. Shelley returned on board with Williams on July 8th. It was a day of dark, lowering, stifling heat. Trelawny took leave of his two friends, and about half-past six in the evening found himself startled from a doze by a frightful turmoil of storm. The *Don Juan* had by this time made Via Reggio; she was not to be seen, though other vessels which had sailed about the same time were still discernible. Shelley, Williams, and their only companion, a sailor-boy, perished in the squall. Trelawny laboriously tracked out the shore-washed corpses of Shelley and Williams, and undertook the burning of them, after the ancient Greek fashion, on the shore near Via Reggio, on August 15 and 16, 1822. The great poet's ashes were then collected, and buried in the new Protestant cemetery in Rome.

The character of Shelley can be considered according to two different standards of estimation. We can estimate the original motive forces in his character; or we can form an opinion of his actions, and thence put a certain construction upon his personal qualities.

In person Shelley was attractive, winning, and almost beautiful, but not to be called handsome. His height was nearly five feet eleven inches; he was slim, agile, and strong, with something of a stoop; his complexion brilliant, his hair abundant and wavy, dark-brown but early beginning to grizzle; the eyes, deep-blue in tint, have been termed "stag-eyes"—large, fixed, and beaming. His voice was wanting in richness and suavity—high-pitched, and tending to the screechy; his general aspect, though extremely variable according as his mood of mind and his expression shifted, was on the whole uncommonly juvenile.

From this necessarily very slight account of the life of Shelley we pass to a consideration—and this too must be equally slender—of his works in poetry. If we except Goethe (and for convenience' sake leaving out of count any living writers, whose ultimate value cannot at present be assessed), we consider Shelley to be the supreme poet of the new era which, beginning with the French Revolution, remains continuous into our own day. Lord Byron and Victor Hugo come the nearest to Shelley in poetic stature, and each of them might for certain reasons be even preferred to him; Wordsworth also has his numerous champions. The grounds on which to set Shelley highest of all are mainly three. He excels all his competitors in ideality, he excels them in music, and he excels them in importance. Of his early work prior to *Queen Mab*—such romances as *Zastrozzi* and *St. Irvyne*, such verse as the *Fragments of Margaret Nicholson*—we can only here say that they are rubbish. *Alastor* was succeeded (1817) by *The Revolt of Islam*, a poem of no common length in the Spenserian stanza, preaching bloodless revolution; it is amazingly fine in parts, but as a whole somewhat long-drawn and exhausting. This transcendental epic (for such it may be termed) was at first named *Laon and Cythna, or the Revolution of the Golden City*, and the lovers of the story were then brother and sister as well as lovers—an experiment upon British endurance which the publishers would not connive at. The year 1818 produced *Rosalind and Helen*, a comparatively weak poem, and *Julian and Maddalo*, a very strong one. The next year, 1819, was his culmination, producing as it did the grand tragedy of *The Cenci* and the sublime ideal drama *Prometheus Unbound*, which we have no hesitation in calling his masterpiece. It embodies, in forms of surpassing imagination and beauty, Shelley's deepest and most daring conceptions. It is closely analogous to the argument of the juvenile poem *Queen Mab*, but so raised in form and creative touch that, whereas to write *Queen Mab* was only to be an ambitious and ebullient tyro, to invent *Prometheus Unbound* was to be the poet of the future. *The Witch of Atlas* (1820) appears to us the most perfect work among all Shelley's longer poems, though it is neither the deepest nor the most interesting. The elegy on Keats, *Adonais*, followed in 1821; the *Triumph of Life*, a mystical and most impressive allegory, constructed upon lines marked out by Dante and by Petrarch, was occupying the poet up to the time of his death. The stately fragment which remains is probably but a small portion of the projected whole. The translations—chiefly from Homer, Euripides, Calderon, and Goethe—date from 1819 to 1822, and testify to the poetic endowment of Shelley not less absolutely than his own original compositions. From this list it will be readily seen that Shelley was not only a prolific but also a versatile poet. Works so various in faculty and in form as *The Revolt of Islam*, *Julian and Maddalo*, *The Cenci*, *Prometheus Unbound*, *Epipsychidion*, and the grotesque effusions of which *Peter Bell the Third* is the prime example, added to the consummate array of lyrics, have seldom to be credited to a single writer—one, moreover, who died before he was thirty years of age. In prose Shelley could be as admirable as in poetry. His letters to Thomas Love Peacock and others, and his uncompleted *Defense of Poetry*, are the chief monuments of his mastery in prose: and certainly no more beautiful prose—having much of the spirit and the aroma of poetry, yet without being distorted out of its proper essence—is to be found in the English language.

SHELOMOH IBN GEBIROL. See AVICEBRON.

SHEM. See NOAH. Compare SEMITIC LANGUAGES.

SHEMAHA, a formerly important but now insignificant town in Transcaucasia, in 40° 38′ N latitude and 66° 19′ E. longitude, on the Zagolovai, an affluent of the Peerssagat, which falls into the Caspian. It is situated in a mountainous, very picturesque country, covered with luxuriant vegetation, at about 2,230 feet above the level of the Black Sea. In 1873 it had 25,087 inhabitants, of whom 18,680 were Tartars and Shachsevans, 5,177 Armenians, and 1,230 Russians. Some 300 Armenian families now profess Lutheranism —the result of a mission first established at Shemaha about twenty years ago In recent times Shemaha has suffered greatly from earthquakes: in 1859 it was shaken to its foundations, and in consequence the seat of the governor was removed to Baku; in 1872, January 16, there occurred a still more terrible shock, from which the town has never recovered. Silk manufacture is the principal industry in Shemaha. In 1873 there were 130 silk-winding establishments, owned mostly by Armenians. The industry has, however, since 1864 considerably declined.

The district of Shemaha (4,426 square miles), corresponding to the ancient khanate of Shirván, lies along the southern slope of the main chain of the Eastern Caucasus. It contains a population of 97,801 inhabitants (1873), of whom 8,493 are Russians, 14,838 Armenians, 73,124 Tartars, 638 Jats (old Persian tribe), and 708 Jews. As everywhere in Transcaucasia, the number of males is considerably in excess over the females (100 to 81). The district occupies a sparsely-wooded mountainous region, completely shut up on the north, and open to the dry, large, and mostly desolate valley of Kura on the south. The climate is generally healthy, rather dry and moderately warm; in the lower parts the people suffer from malarious fever. The annual rainfall in Shemaha is 14.52 inches, the mean summer temperature 73° Fahr., winter 37°. The soil, mostly of the Tertiary formation, is very rich and of considerable variety. This district occupies in Transcaucasia a foremost place in vine-growing and in the silk industry. The vine region, in the southwest of the district, is a long strip of land of breadth varying from four to twenty miles. The highest level of the vine is about 2,500 feet above the sea. The plant is left unprotected in winter, and owing to the abundance of water occasioned by the melting snows and the heavy rains in spring, there is no need of irrigation. According to a general survey made in 1875 there are in the district 3,098 vineyards, occupying a total of 1,754 acres. The other products are principally wheat, cotton and rice. In 1875 the annual vintage at Shemaha was calculated at about 62,160 gallons. The best wine is that of Matrassy.

SHENANDOAH, a populous city of Schuylkill county in one of the most productive mining areas of Pennsylvania, is located on the Lehigh Valley and Philadelphia and Reading railroads, fourteen miles from Pottsville, the county seat. One of the principal, if not the chief industry in operation here, is coal mining, in which there are an immense number of hands employed and a total output of from one million to one and one-half millions of tons produced annually. The city has two daily and two weekly papers, also a monthly periodical representing the mining interests, one bank, ten churches, graded schools, stores, hotels, and public halls. The population in 1890 was 15,944.

SHENANDOAH RIVER is the name of a well-known tributary of the Potomac.

SHENANDOAH VALLEY, a valley in the northwestern portion of Virginia, that by reason of its beautiful scenery and charming surroundings has been likened to the Vale of Avoca. It derives its name from the Shenandoah river, formed by the junction of North and South Forks at Front Royal. For a distance of forty miles from each other these two streams flow along both sides of the Massanutten range, until they reach their confluence. The South Fork, in reality the Shenandoah river, skirts the Blue Ridge mountains to the west for a distance of nearly 175 miles, and empties into the Potomac river in sight of the historic town of Harper's Ferry. The direction of the valley is from northeast to southwest, from the Potomac through the most picturesque portions of Virginia into the rugged mountainous plateau of North Carolina, finally becoming lost in the range dividing that State from Tennessee In Virginia the valley maintains an average width of about twenty miles, with the Blue Ridge mountains marking the eastern and the North mountains the western boundary.

At Lexington the valley is divided in twain by a suppositious line, to the south of which the country is mountainous, sterile, and inaccessible, while to the north the country is under a high state of cultivation The remaining rivers are the North river, a branch of the James, and New river, which leaves the valley and enters West Virginia. Cedar creek emptying into the Shenandoah at Strasburg, and the Opequan, which flows north into the Potomac, are important streams also. The principal occupation of the inhabitants is farming, though cattle raising is extensively engaged in, and the distillation of whisky is to a limited extent carried on. The leading towns are Woodstock, Harrisburg, Strasburg, Staunton, Lexington, Port Republic, Front Royal, Luroy, and New Market. The Atlantic, Mississippi Valley and Newport News, Baltimore and Ohio, and Virginia Midland railroads are operated in the valley and afford the means for passenger and freight traffic enjoyed by the inhabitants. During the Civil war the importance of the valley as a source of supply and base of operations was recognized by the leaders of both armies, and its possession disputed by the rival forces until March, 1865, when the defeat of Early at Waynesboro placed the valley under Federal control, and military operations in the valley reached a permanent period.

SHENDY, a town on the right bank of the Nile, about 130 miles south of Berber and 100 north of Khartúm, which, while its present population does not exceed 2,500, was previous to its destruction by the Egyptians in 1822 a place of some 50,000 inhabitants and a station on the great caravan route between Sennâr and Egypt and Mecca. The terrible massacre perpetrated by the Egyptians was in revenge for the treacherous assassination by the native chiefs at Shendy of Ismail Pasha and his suite, who were first drugged and then burned to ashes with their huts. Shendy was the capital of a considerable district, and lies only twenty miles south of the ruins of Meroe.

SHENSTONE, WILLIAM, is one of the best-known minor poets of the eighteenth century. He was born at Leasowes in the parish of Hales-Owen, Worcestershire, England, in 1714, and after passing through Pembroke College, Oxford, retired there to realize Pope's ideal in the *Ode to Solitude*, turned his paternal estate into an elaborate landscape garden, and lived there till his death in 1763. Shenstone practiced the elegiac form assiduously, and some of his elegies are not without a certain imposing pomp and dignity of language, but we may safely suppose that it was the sentiments rather than the expression that captivated the peasant poet. His *Pastoral Ballads in Four Parts*, one of his earliest compositions, is also one of his best, and from its use in selections of poetry for the young is much more generally known. But his *Schoolmistress*, in the Spenserian stanza (published in 1742, and so relieved from any suspicion of being an imitation of Thompson), is the poem by which he keeps a place in literature.

SHEPTON MALLET, a market-town of Somersetshire, England, is situated at the eastern extremity of the Mendip hills, on the Somerset and Devon and the East Somerset railways, five miles east of Wells and twenty south of Bristol. The principal public buildings are the court-house (1857), the masonic hall (1861), the prison, and the district hospital (1880). The market cross, one of the finest in the county, fifty-one feet in height, erected by Agnes and Thomas Buckland in 1500, was restored in 1841. About the end of the last century Shepton Mallet had important cloth manufactures, and stocking-knitting was also largely carried on. The brewing of ale and porter is now one of its principal industries, and it has also ropeworks and brick and tile works. In the vicinity there are granite quarries and marble, asphalt, and lime works. The population of the urban sanitary district (area, 3,572 acres) in 1871 was 5,149, and in 1881 it was 5,322.

SHERBORNE, an ancient market-town of Dorsetshire, England, on the borders of Somersetshire, is situated on the southern slope of a hill overlooking the river Yeo, on the South-Western railway, 6 miles east from Yeovil and 118 southwest from London by rail. The population of the urban sanitary district (area 411 acres) in 1871 was 5,545, and in 1881 it was 5,053.

SHERBROOKE, a city of the province of Quebec, Canada, and the capital of Sherbrooke county, is located on the Magog river, 195 miles from Portland, Me., 100 miles from Montreal, and 125 miles from Quebec. It is also on the Grand Trunk and International railways, and the terminus of the Passumpsic and Vermont Central and the Quebec Central roads. From the situation of the city, together with its natural and acquired advantages, it has become a trade center, where the volume of business is annually attaining larger proportions. Copper mines have been opened contiguous to the city, and are being worked advantageously, while the adjoining country is agriculturally productive. There are four papers issued weekly, two of which are French publications; also a monthly periodical. The city contains three banks, six churches, an academy, about fifty stores, and a full line of manufactures, including woolen and cotton mills, foundries and machine shops, ax and woodenware factories, saw and grist mills, breweries, etc., etc. The population of the city in 1890 was estimated at 7,277.

SHERIDAN, the name of an Anglo-Irish family, made illustrious by the dramatist Richard Brinsley, but prominently connected with literature in more than one generation before and after his. We take the family in chronological order.

1. THOMAS SHERIDAN, D.D., grandfather of the dramatist, was the first to connect the family with literature, and was born in 1684. He is chiefly known as the favorite companion and confidant of Swift during his later residence in Ireland. When Swift came to Dublin as dean of St. Patrick's, Sheridan was established there as a schoolmaster of very high repute—a fashionable schoolmaster, with a small landed patrimony in Cavan, and a bishop in the family two generations back. He so won upon the dean with his mirthfulness, wit, scholarship, good-nature, and honesty that in a short time no party made for the dean's entertainment was considered complete without Sheridan. Sheridan was his confidant in the affair of *Drapier's Letters;* it was at Quilca, Sheridan's country cottage in Cavan, that *Gulliver's Travels* was prepared for the press. Through Swift's influence he obtained a living near Cork, but damaged his prospects of further preferment by a feat of unlucky absence of mind. Having to preach at Cork on the anniversary of Queen Anne's death, he hurriedly chose a sermon with the text, "Sufficient unto the day is the evil thereof," and was at once struck off the list of chaplains to the lord-lieutenant and forbidden the castle. In spite of this mishap, he "still remained," according to Lord Orrery, "a punster, a quibbler, a fiddler, and a wit," the only person in whose genial presence Swift relaxed his habitual gloom. His latter days were not prosperous, probably owing to his having "a better knowledge of books than of men or of the value of money," and he died in poverty and ill-health in 1738.

2. THOMAS SHERIDAN, son of the above, born at Quilca in 1721, had a more conspicuous career than his father. This ambitious father sent him to an English school, Westminster, but he was forced by stress of circumstances to return to Dublin and complete his education at Trinity College. Then he went on the stage and at once made a local reputation. Sheridan's first appearance in London was at Covent Garden in March, 1744, when, heralded in advance as the brilliant Irish comedian, he acted for three weeks in a succession of leading parts, "Hamlet" being the first. He did not appear in London again till ten years afterward, when he was the leading actor for a season at the same theater. In the interval he had been manager of a theater in Dublin, had married a highly accomplished and well-born lady (see next notice), and had been driven from Dublin as a result of taking the unpopular side in politics. After his season in London he tried Dublin again, but after two years more of unremunerative management, he left for England finally in 1758. By this time he had conceived his scheme of British education, and it was to push this rather than his connection with the stage that he crossed St. George's Channel. He lectured at Oxford and Cambridge; and received honorary degrees from both universities in 1758 and 1759. But the scheme did not make way, and we find him in 1760 acting under Garrick at Drury Lane. His merits as an actor may be judged from the description of him in the *Rosciad* at this period. He is placed in the second rank, next to Garrick.

Sheridan, however, attracted attention chiefly by his enthusiastic advocacy, in public lectures and books, of his scheme of education, in which oratory was to play a principal part. His main count was that it did not fit the higher classes for their duties in life, that it was uniform for all and profitable for none; and he urged as a matter of vital national concern that special training should be given for the various professions. Oratory came in as part of the special training of men intended for public affairs, but his main contention was one very familiar now—that more time should be given in schools to the study of the English language. In 1769, after a residence of some years in France, he published a matured *Plan of Education*, with a letter to the king, in which he offered to devote the rest of his life to the execution of his theories on condition of receiving a pension equivalent to the sacrifice of his professional income. His offer was not accepted; but Sheridan, still enthusiastic, retired to Bath, and prepared a pronouncing *Dictionary of the English Language*, with a prosodial grammar. After his son's brilliant success he assisted in the management of Drury Lane, and occasionally acted. His *Life of Swift*, a very entertaining book in spite of its incompleteness as a biography, was published in 1784. He died at Margate in 1788.

3. Frances Sheridan, wife of the above, and mother of the dramatist, was born in 1724. She wrote two novels of high repute in their day, *Sidney Biddulph* and *Nourjahad*, and two plays, *The Discovery* and *The Dupe. The Discovery* was first produced in 1763. Mrs. Sheridan's novels and plays were all written in the last six years of her life. She died at Blois in 1766.

4. Richard Brinsley Butler Sheridan, second son of Thomas and Frances Sheridan, was born in Dublin in September, 1751. Sheridan left Harrow at the age of seventeen, having impressed his schoolfellows at least, who are sometimes better judges than their masters, with a vivid sense of his powers. It was probably his father's design to send him afterward to Oxford, but the family circumstances were too straitened to permit of it, and the educationist, who had just then returned from France, and was about to launch his appeal to the king on behalf of his new plan of education, took his son home and himself directed and superintended his studies. After leaving Harrow he kept up a correspondence with a school friend who had gone to Oxford. With this youth, whose name was Halhed, he executed and published metrical translations of Aristænetus—an obscure Greek or pseudo-Greek author brought to light or invented at the Renaissance, a writer of imaginary amorous epistles.

In conjunction with the same young friend he began a farce entitled *Jupiter*. It was not completed, but the fragment is of interest as containing the same device of a rehearsal which was afterward worked out with such brilliant effect in *The Critic*. The removal of the family to Bath in 1771 extended his field of observation. There was in Bath a celebrated musical family—the daughters of the composer Linley, the head of his profession in the fashionable town. The eldest daughter, a girl of sixteen, the prima donna of her father's concerts, was exceedingly beautiful, and very much run after by suitors, young and old, honorable and dishonorable. In the latter class was a Captain Mathews, a married man; in the former, young Sheridan. Mathews had artfully won the girl's affections, and persecuted her with his importunities, threatening to destroy himself if she refused him. To protect her from this scoundrel's designs the younger lover conceived the romantic plan of escorting Miss Linley to a nunnery in France. After performing this chivalrous duty he returned and fought two duels with Mathews, which made a considerable sensation at the time. Ultimately, after a courtship romantic enough to have satisfied Lydia Languish, Sheridan and Miss Linley were married in April, 1773.

Sheridan's daring start in life after this happy marriage showed a confidence in his genius which was justified by its success. Although he had no income, and no capital beyond a few thousand pounds brought by his wife, he took a house in Orchard street, Portman square, furnished it "in the most costly style," and proceeded to return on something like an equal footing the hospitalities of the fashionable world. Sheridan's conduct may have been youthful pride and recklessness, the thoughtless magnificence of a strong and confident nature; all the same, it answered the purpose of deep-laid and daring policy. When remonstrated with by a friend, and asked how he found the means of supporting such a costly establishment, he is said to have answered—"My dear friend, it is my means." And so it proved, for his social standing and popularity helped to get a favorable start for his first comedy, *The Rivals*, produced at Covent Garden on January 17, 1775.

The Rivals is said to have been not so favorably received on its first night, owing to its length and to the bad playing of the part of Sir Lucius O'Trigger. But the defects were remedied before the second performance, and the piece at once took that place on the stage which it has never lost. *St. Patrick's Day, or the Scheming Lieutenant*, a lively farce, written it is said at the request of Clinch, in gratitude for his coming to the rescue of Sir Lucius, was produced in May. In the course of the year, with the assistance of his musical father-in-law, he wrote the comic opera of *The Duenna*. It was the great theatrical success of the winter of 1775–76; it ran even longer than *The Beggar's Opera* had done—up to that time the longest run on record. He became interested in the management of Drury Lane theater by the end of the year.

It was opened under the new management in February, 1777, with a purified version of Vanbrugh's *Relapse*, under the title of *A Trip to Scarborough*. This is printed among Sheridan's works, but he has no more title to the authorship than Colley Cibber to that of *Richard III*. *The School for Scandal* was produced little more than two months afterward. There are tales of the haste with which the conclusion of *The School for Scandal* was written, of a stratagem by which the last act was got out of him by the anxious company, and of the fervent "Amen" written on the last page of the copy by the prompter, in response to the author's "Finished at last, thank God!"

The third and last of Sheridan's great comedies *The Critic*, was produced in 1779, *The School for Scandal* meantime continuing to draw larger houses than any other play every time it was put on the stage. His only dramatic composition during the remaining thirty-six years of his life was *Pizarro*, produced in 1799—a tragedy in which he made liberal use of some of the arts ridiculed in the person of Mr. Puff. He is said also to have written more of *The Stranger* than he was willing to acknowledge.

He entered parliament for Stafford in 1780. It was not a sudden ambition to shine on a wider stage after having gained the highest honors of the theater. Ever since leaving Harrow he had dabbled a little in politics, had sketched letters in the manner of Junius, and begun an answer to Johnson's *Taxation no Tyranny*. His first speech in parliament, like the first speech of a great parliamentarian of this century, between whose career and Sheridan's there are many striking points of resemblance and contrast, was a failure. But he persevered, spoke little for a time and chiefly on financial questions, soon took a place among the best speakers in the House, and under the wing of Fox filled subordinate offices in the short-lived ministries of 1782 and 1783. He was under-secretary for foreign affairs in the Rockingham ministry, and a secretary of the treasury in the Coalition ministry.

The occasion that gave Sheridan a chance of rising above the reputation of an extremely effective and brilliant debater into the ranks of great parliamentary orators was the impeachment of Warren Hastings. His speeches in that proceeding were by the unanimous acknowledgment of his contemporaries among the greatest delivered in that generation of great orators. The first was in 1787, on Burke's proposal that Hastings should be impeached. Sheridan spoke for three hours, and the effect of his oratory was such that it was unanimously agreed to adjourn and postpone the final decision till the House should be in a calmer mood. Of this, and of his last great speech on the subject in 1794, only brief abstracts have been preserved; but with the second, the four days' speech in Westminster Hall, on the occasion so brilliantly described by Macaulay, posterity has been more fortunate. Gurney's verbatim reports of the speeches on both sides at the trial were published in 1859, and from them we are able to form an idea of Sheridan's power as an orator. There are passages here and there of gaudily figurative rhetoric, loose ornament, and declamatory hyperbole such as form the bulk of the incorrect version.

Sheridan's long parliamentary career terminated in 1812. He could not help being to the last a conspicuous figure both in society and in parliament, but from the time of the break-up of the Whig party on the secession of Burke he was more or less an "independent member" and his isolation was complete after the death of Fox. The Begum speech remained his highest oratorical achievement. By it he is fixed in the tradition of the House as one of its greatest names. But his opinions on other great questions were given with a force and eloquence worthy of his position. After Fox's death he succeeded his chief in the representation of Westminster, and aspired to succeed him as leader of the party, but this claim was not allowed, and thenceforward Sheridan fought for his own hand. When the prince became regent in 1811 Sheridan's private influence with him helped to exclude the Whigs from power. Throughout his parliamentary career Sheridan was one of the boon companions of the prince, and his champion in parliament in some dubious matters of payment of debts.

His last years were harassed by debt and disappointment. At the general election in 1812 he stood for Westminster and was defeated, and turned in vain to his old constituents of Stafford. He could not raise money enough to win back their confidence. As a member of parliament he had been safe against arrest for debt, but now that this protection was lost his creditors closed in upon him, and from this time until his death, July 7, 1816, the life of Sheridan, broken in health and fortune, discredited in reputation, slighted by old associates, so enfeebled and low-spirited as to burst into tears at a compliment, yet at times vindicating his reputation as the wittiest of boon companions, is one of the most painful passages in the biography of great men.

SHERIF (Arab noble) designates among Moslems a descendant of Mohammed, the prophet, through his daughter Fatima and Ali. The title is inherited both from the paternal and the maternal side, and thus the number of members of this aristocracy is very large among the Moslems. The men have the privilege of wearing green turbans [See BYRON'S *Giaour*], and the women of wearing green veils, and they mostly avail themselves of this outward badge of nobility—the prophets' color—while the turbans and veils of other Moslems are white. Many of the earlier Sherifs founded dynasties in Africa, and the rulers of Fez and Morocco to-day boast the same distinction.

SHERIFF. The position of the sheriff as an executive officer in the United States is very similar to that of the English sheriff. He is usually appointed by popular election. The marshals of the United States and their deputies have in each State the same powers in executing the laws of the United States as the sheriffs and their deputies have in executing the laws of the State. The civil jurisdiction of the sheriff was originally of very wide extent, and was deemed specially applicable to questions relating to the land within the shire. The criminal jurisdiction of the sheriff was in its origin of almost universal extent. But this was first limited to cases where the offenders were caught in or shortly after the act, afterward to cases in which the trial could be held within forty days, and subsequently further restricted as the business of the justiciary court became more organized.

The office of sheriff is of great antiquity and the incumbent was formerly chosen in England by the people, though probably even then requiring confirmation by the crown. In the time of Edward II. the right of popular choice of sheriff was taken away and since that time the sheriffs of all England (except the city of London) are selected by the law officers and judges, as representing the sovereign. Three persons are selected from each county and the first of each list is generally called upon to serve. An English sheriff continues in office one year and cannot be compelled to serve a second time. The position is an onerous and expensive one, as on the sheriff falls the duty and expense of entertaining the judges of assize. Gentlemen of wealth and landed property are always selected, but many prefer to pay a heavy fine rather than to serve. Peers of the realm are exempt from service as sheriffs. The sheriff of an English county ranks next to the lord lieutenant of the county, and although a commoner, takes precedence, during his year of office, of all noblemen within his bailiwick.

To the sheriff, both in the United States and in England, falls the duty of summoning the *posse comitatus*, that is of calling out the people to preserve the peace in case of riot or other disturbance. The chief legal duty which the sheriff discharges is that of executing, *i. e.*, of carrying out the judgments and orders of the courts of law. He it is who, through his deputies and bailiffs, seizes the goods of debtors, and for the proper disposition of such property he is bound in law.

In the United States the powers and duties of the sheriff include not only the service of papers, the summoning of jurors and the execution of civil judgments, but also the care of prisoners awaiting trial, and of those undergoing jail sentences. He is the custodian of the county jail and usually of the court-house also. To him falls the decidedly unpleasant task of executing, personally or by deputy, the last sentence of the law upon criminals convicted of capital crime.

SHERIFF-MUIR, a name given to several moors in Scotland on account of the 'wapinschaws' which used to be there held, under the superintendence of the sheriff. The only moor of this name which appears prominently in Scottish history is situated in Perthshire, on the northern slope of the Ochils, two miles northeast of Dunblane, and was the site of the great battle between the adherents of the Houses of Stewart and Hanover, 13th November, 1715. The former, who consisted of the northern clans under the Earl of Seaforth, and the western clans under General Gordon, numbering about 9,000 in all, were on their march southward, under the leadership of the Earl of Mar, to join the Jacobites who had risen in the northwest of England, when they were met by the Duke of Argyle at the head of 3,500 disciplined troops. After lying under arms all night, the Macdonalds, who formed the center and right of the Highland army, attacked the left of their opponents, and routed it so completely that the fugitives fled with all speed to Stirling, carrying the news that Argyle had been totally defeated. Argyle, however, with his dragoons had meantime driven the left of the Highlanders back for two miles, when the right and center returned from the pursuit, and took him in rear; he then skilfully withdrew his men to a place of shelter, and remained facing his opponents till the evening, when he retired to Dunblane, and next day to Stirling. About 500 were slain on each side. As a mere battle, the victory lay with the Highlanders; but it was so little decisive, that it paralyzed the action of the Jacobites almost as effectually as a defeat would have done.

SHERLOCK, Thomas, bishop of London, the son of Dr. William Sherlock, noticed below, was born at London in 1678 He was educated at Catherine Hall, Cambridge, and in 1704 succeeded his father as master of the Temple. He took a prominent part in the Bangorian controversy against Hoadly, whom he succeeded as Bishop of Bangor in 1728; he was afterward translated to Salisbury in 1734, and to London in 1738. He published against Collins' *Grounds and Reasons of the Christian Religion* a volume of sermons entitled *The Use and Intent of Prophecy in the Several Ages of the World* (1725); and in reply to Woolston's *Discourses on the Miracles* he wrote a volume entitled *The Trial of the Witnesses of the Resurrection of Jesus* (1729), which in a very short time ran through fourteen editions. He died in 1761. A collected edition of his works in 5 vols. 8vo, by Hughes, appeared in 1830.

SHERLOCK, William, dean of St. Paul's, was born at Southwark, England, in 1641, and educated at Eton and Cambridge (Peterhouse). In 1669 he became rector of St. George, Botolph Lane, London, and in 1681 he was appointed a prebendary of St. Paul's. In 1684 he published *The Case of Resistance of the Supreme Powers stated and resolved according to the Doctrine of the Holy Scriptures.* In 1686 he was reproved for preaching against popery and his pension stopped. After the Revolution he was suspended for refusing the oaths to William and Mary, but before his final deprivation he yielded, justifying his change of attitude in *The Case of the Allegiance due to Sovereign Powers stated and resolved according to Scripture and Reason and the Principles of the Church of England* (1691). During the period of his suspension he wrote a *Practical Discourse concerning Death*, which became very popular and has passed through many editions. He became dean of St. Paul's in 1691, and died at Hampstead in 1707.

SHERMAN, a city of Grayson county, Tex., of which it is also the county seat, has attained remarkable growth within a comparatively few years. It is located on the Houston and Texas Central road, at its intersection with the Texas and Pacific and St. Louis, Arkansas and Texas roads, a dozen miles from the Red river, 270 miles north-by-east from Austin, 67 miles in the same direction from Dallas and 150 miles west of Marshall. As a railroad and commercial center Sherman enjoys superior advantages, and has during a recent period advanced from an inconspicuous inland town to a city of importance as the base of supplies for a large and highly cultivated region of country, as also the shipping point for continually increasing crops of cotton and other agricultural products. It is the location of Austin College, an institution of learning of established worth and more than local reputation, also of a high school and educational facilities generally, both public and private, of acknowledged excellence. The city contains two daily and two weekly papers, two banks with an aggregate cash capital of nearly $2,000,000, seven churches, several hotels, the Sherman Opera House and other improvements of a valuable and substantial character. Foundries, machine shops, mills, mattress, harness, collar and soap factories are conducted successfully and furnish employment to large numbers of men. The city is provided with street railways, and is lighted with gas and electricity. The population in 1870 was 1,439; 6,093 in 1880, and 7,320 in 1890.

SHERWIN, John Keyse, engraver and historical painter, was born in 1751 at East Dean in Sussex, Eng. His father was a wood-cutter employed in shaping bolts for shipbuilders; the son was befriended by Mr. William Mitford, upon whose estate the elder Sherwin worked, and was sent to study in London, first under John Astley, and then for three years under Bartolozzi—for whom he is believed to have executed a large portion of the plate of Clytie, after Annibal Caracci, published as the work of his master. He was entered as a student of the Royal Academy, and gained a silver medal, and in 1772 a gold medal for his painting of *Coriolanus Taking Leave of his Family.* From 1774 till 1780 he was an exhibitor of chalk drawings and of engravings in the Royal Academy. Establishing himself in St. James' street as a painter, designer, and engraver, he speedily attained popularity, and began to mix in fashionable society. His drawing of the *Finding of Moses*, a work of but slight artistic merit, which introduced portraits of the princess royal of England and other leading ladies of the aristocracy, hit the public taste, and, as reproduced by his burin, sold largely. In 1785 he succeeded Woollett as engraver to the king, and he also held the appointment of engraver to the prince of Wales. He died in extreme penury September 24, 1790—according to Steevens, the editor of *Shakespeare*, at "The Hog in the Pound," an obscure alehouse in Swallow street, or, as stated by his pupil J. T. Smith, in the house of Robert Wilkinson, a printseller in Cornhill.

SHETLAND ISLANDS. See Orkney and Shetland.

SHIELD. See Arms and Armor, and Heraldry.

SHIELD, William, composer of English operas, was born at Swalwell, near Newcastle, England, in 1748. Notwithstanding the difficulties inseparable from his imperfect training, he obtained admission into the opera band in 1772. In the meantime he turned his serious attention to composition, and in 1778 produced his first comic opera, *The Flitch of Bacon*, at the Little Theater in the Haymarket, with so great success, that he was immediately engaged as composer to Covent Garden theater, for which he continued to produce English operas and other dramatic pieces, in quick succession, until 1797, when he resigned his office. He died in London January 25, 1829, and was buried in the south cloister of Westminster Abbey.

Shield's most successful dramatic compositions were *Rosina*, *The Mysteries of the Castle*, *The Lock and Key*, and *The Castle of Andalusia.* As a composer of songs he was in no degree inferior to his great contemporary Charles Dibdin. Indeed *The Arethusa*, *The Heaving of the Lead*, and *The Post Captain* are as little likely to be forgotten as Dibdin's *Tom Bowling* or *Saturday Night at Sea.*

SHIELDS, North. See Tynemouth, within which borough the port is included.

SHIELDS, South, a seaport, market-town, and municipal and parliamentary borough of Durham, England, is situated on the south bank of the Tyne, at its mouth, immediately opposite North Shields and Tynemouth, and on the Northeastern Railway, eighteen miles northeast of Durham and nine east of Newcastle-on-Tyne. It is connected with North Shields and Tynemouth by steam ferries. The town possesses a spacious market-place, and some of the newer streets are wide and handsome, but the old street running along the shore is narrow and mean. Formerly salt was largely manufactured, but the principal industries now are the manufacture of glass and chemicals, and shipbuilding and ship refitting and repairing, for which there are docks capable of receiving the largest vessels. The Northeastern Railway Company possesses extensive docks, and the port has a large trade in coal. A townsman of South Shields, William Wouldhave, was the inventor of the lifeboat, and the first lifeboat was built there by Henry Greathead, and first used in a storm in 1789. The town received a charter of incorporation in 1850, and is divided into three wards, governed by a mayor, eight aldermen, and twenty-four councilors. In 1832 it received the privilege of returning a member to parliament. The corporation acts as the urban sanitary authority, and the town has a specially good water supply from reservoirs at Cleadon. The population of the municipal and parliamentary borough (area 1,839 acres) was 45,336 in 1871, and in 1881 it was 56,875.

SHI'ITES. See SUNNITES AND SHI'ITES.

SHIKÁRPUR, a British district in the province of Sind, Bombay presidency, India, with an area of 10,000 square miles, lying between 27° and 29° N. latitude and between 67° and 70° E. longitude. It is bounded on the north by Khelat, Upper Sind Frontier district, and the river Indus; on the east by the native states of Bahawalpur and Jaisalmir; on the south by Khairpur state; and on the west by the Khirthar mountains. Shikárpur is a vast alluvial plain, broken only at Sukkur and Rohri by limestone hills. The Khirthar range attains an elevation of 7,000 feet, and forms a natural boundary between the district and Baluchistan. Extensive patches of salt land, known as *kalar*, are frequently met with, especially in the upper portion of Shikárpur. The desert portion of Rohri subdivision, known as the Registhán, is very extensive. The forests (207 square miles) are situated on the banks of the Indus, mostly in the Rohri and Shikárpur subdivisions. The Indus Valley State railway runs through the district, and the Kandahar railway also goes through a part of it.

In 1881 the population numbered 852,986 (males 461,033 females 391,953), of whom 93,341 were Hindus, 684,275 Mohammedans, and 736 Christians. The chief towns are Shikárpur, Sukkur (population 27,389), Larkhana (13,188), and Rohri (10,224). The cultivated land in 1882-83 amounted to 764,488 acres, of which 108,636 were twice cropped. Cereals—chiefly rice, joár (millet), and wheat—form the principal crops; but a considerable area is also under pulses and oil-seeds. The chief manufactures are carpets and coarse cotton cloths.

SHIKÁRPUR, the chief town of the above district, is situated eighteen miles west of the Indus, in a tract of low-lying country annually flooded by the canals from that river. It is a great entrepôt for transit trade between the Bolan Pass and Karachi. The population in 1881 numbered 42,496 (males 22,889, females 19,607.)

SHILOH, a town of Ephraim, where the sanctuary of the ark was, under the priesthood of the house of Eli. Shiloh seems to have been destroyed by the Philistines after the disastrous battle of Ebenezer; *cf.* Jeremiah vii. 12 *seq.* The position described in Judges, *loc. cit.* (*cf. Onomastica*, ed. Lagarde, p. 152), gives certainty to the identification with the modern Seilûn lying some two miles east-southeast of Lubbán (Lebonah), on the road from Bethel to Shechem. Here there is a ruined village, with a flat double-topped hill behind it offering a strong position, which suggests that the place was a stronghold as well as a sanctuary. A smiling and fertile landscape surrounds the hill. The name Seilûn corresponds to Σιλοῦν in Josephus. LXX. has Σηλώ Σηλώμ. The forms given in the Hebrew Bible (שילה, שילו) have dropped the final consonant, which reappears in the adjective שילוני. On Shiloh in Gen. xlix. 10 see JUDAH.

SHILOH, BATTLE OF (see GRANT), described by some writers as the "bloodiest battle of the Civil war," was fought between the Federal army under the command of Gen. U. S. Grant and the Confederate forces led by Gen. Albert Sidney Johnston, April 6 and 7, 1862. The scene of the battle was Pittsburg Landing on the west bank of the Tennessee river eight miles above Clarksville, Tenn., and twenty-five miles northeast of Corinth, Miss., the name of the battle, however, being due to Shiloh church, located at a point on the field where one of the final and most desperate of the struggles between the contending forces was made. The Federal army was composed of 33,000 men included in the divisions commanded by Generals Sherman, McClernand, Prentiss, Smith, W. H. L. Wallace, and Lew Wallace. According to the plan of battle, hastily arranged when the Confederate advance compelled the Union pickets to retire at daylight on the morning of April 6, 1862, Sherman was stationed opposite Shiloh church, flanked on the right by McClernand's forces and on the left by those of Prentiss. Hurlbut and Smith occupied a position to the rear of the main line, while Lew Wallace's division was at a place near by called Crumps Landing. The position of the army and Grant's failure to fortify Pittsburg Landing were made the subjects of caustic criticism at the time.

After the capture of Forts Donelson and Henry, Albert Sidney Johnston was placed in command of the Confederate armies operating in the west and southwest. The forces in the immediate vicinity of Pittsburgh Landing numbered 40,000 men belonging to the divisions of Generals Beauregard, Polk, Bragg, and Breckenridge, and were concentrated at Corinth. It has since been learned that Johnston had mapped out a campaign with Pittsburg Landing as its objective point, as early as March 23d previous, hoping to defeat Grant before the latter was able to form a junction with Buell's army at Columbia. On April 3d Johnston was advised of the movement of Buell's forces to unite with Grant's army, whereupon he decided to risk a battle. His army was accordingly moved forward, and arrived opposite the Union lines, where they were drawn up in line of battle Saturday night, April 6, 1862. Of this movement the Union commanders remained in total ignorance, General Grant having the same day written General Halleck that "the main force of the enemy is at Corinth." The advance line of the Confederate army numbered nearly 10,000 men, with an equal number constituting the supporting line, and the seven brigades comprising the divisions of Polk and Breckenridge making up the reserves. The attack was made at 5 o'clock Sunday morning. The Union front was taken by surprise, but almost immediately recovered and made a most obstinate resistance. Later in the day the Union forces were effectively handled. Sherman's division, combined with the divisions of Prentiss and McClernand, and fought to maintain its possession of the field at Shiloh church; still later they were reënforced by the division of W. H. L. Wallace, while the remainder of the army disputed step by step the progress of the enemy. The tide of battle fluctuated with each hour of the day, but as night approached the Union army was forced back to the river, having sustained a terrible loss in the number reported among the killed, wounded, and missing. The arrival of Nelson's division of Buell's army just as the battle concluded for the day, saved the Union army from total destruction. Among the killed was Gen. W. H. L. Wallace, Gen. B. M. Prentiss and a large number being taken prisoners. The Confederates lost Albert Sidney Johnston, killed, together with an unaccountable number of staff and regimental officers, while the mortality among the soldiers was exceptionally great.

The same evening Buell, who had reached the opposite side of the river after the suspension of hostilities

Sunday afternoon, directed his efforts to ferrying the army across the Tennessee and placing it in position. This was accomplished at an early hour Monday morning. Reënforced by the army of General Buell and the division of Gen. Lew Wallace, which arrived from Crumps Landing, in all 26,000 men, Grant assumed the offensive and resumed battle, Beauregard and Bragg having succeeded to the command of the Confederates. The contest raged fiercely throughout the day, but by 3 o'clock in the afternoon the Union army recovered the ground lost Sunday, and by night the enemy was on the retreat to Corinth. The Federals lost in killed, wounded, and missing an aggregate of 13,017; the loss of the Confederate army was stated at 10,695.

SHIMOGA, or SHEEMOGA, a district in the northwest of the native state of Mysore, Southern India. It forms a part of the Nagar division, and is situated between 13° 30′ and 14° 38′ N. latitude, and between 74° 44′ and 76° 5′ E. longitude. It has an area of 3,797 square miles, and is bounded on the north and west by the Bombay districts of Dhárwár and North Kánara, and east and south by the districts of Chitaldroog and Kadur. Its river system is twofold; in the east the Tungra, Bhadra, and Varada unite to form the Tungabhadra, which ultimately falls into the Kistna and so into the Bay of Bengal, while in the west a few minor streams flow to the Shirávati, which near the northwestern frontier bursts through the Western Gháts by the celebrated Falls of Gersoppa, said to be the grandest cataract in India.

The western half of the district is very mountainous and covered with magnificent forests, and is known as the Malnád or hill country, some of the peaks being 4,000 feet above sea-level. The mineral products of the district include iron-ore and laterite. On the summits of the Gháts stones possessing magnetic qualities are occasionally found. The soil is loose and sandy in the valleys of the Malnád, and in the northeast the black cotton soil prevails. Shimoga presents much variety of climate. The southwest monsoon is felt in full force for about 25 miles from the Gháts, bringing an annual rainfall of more than 150 inches, but the rainfall gradually diminishes to 31 inches at Shimoga station and to 25 inches or less at Chennagiri. There is no railroad in the district, but it contains 225 miles of roads.

The population in 1881 was 499,728 (males 259,296, females 240,432); Hindus numbered 470,678, Mohammedans 27,574, and Christians 1,476. Rice is the staple food-crop of the district; the next in importance is sugar-cane; areca-nuts are also extensively grown; and miscellaneous crops include oil-seeds, vegetables, fruits, pepper, and cardamoms. Of the total area of 3,797 square miles only 699 are returned as cultivated and 702 as cultivable. The chief manufactures are coarse cotton cloths, rough country blankets or *kamblis*, iron implements, brass and copper wares, pottery, and jaggery. The district is also noted for its beautiful sandal-wood carving.

SHINTO. See JAPAN.

SHIP. The generic name (A. S. *scip*, Ger. *Schiff*, Gr. *σκαφος*, from the root *skap*, *cf.* "scoop") for the invention by which man has contrived to convey himself and his goods upon water points in its derivation to the fundamental conception by which, when realized, a means of flotation was obtained superior to the raft, which we may consider the earliest and most elementary form of vessel. Primitive efforts in this direction may be classified in the following order: (1) rafts —floating logs, or bundles of brushwood or reeds or rushes tied together; (2) dugouts—hollowed trees; (3) canoes of bark, or of skin stretched on framework or inflated skins (balsas); (4) canoes or boats of pieces of wood stitched or fastened together with sinews or thongs or fibers of vegetable growth; (5) vessels of planks, stitched or bolted together with inserted ribs and decks or half decks; (6) vessels of which the framework is first set up, and the planking of the hull nailed on to them subsequently. All these in their primitive forms have survived, in various parts of the world, with different modifications marking progress in civilization. Climatic influences and racial peculiarities have imparted to them their specific characteristics, and, combined with the available choice of materials, have determined the particular type in use in each locality. In Australia is found the single log of buoyant wood not hollowed out but pointed at the end. Rafts of reeds are also found on the Australian coast. In New Guinea catamarans and similar forms appear on the Madras coast. On the coast of Peru rafts of buoyant wood navigated with sail are to be seen, while dugout canoes have been associated with objects of the Stone Age, and the American continent is the home of the bark canoe. The keel of the modern vessel has its prototype in the single log which was the parent of the dugout, the side planking may be traced to the attempt to fence in the platforms upon sea-going rafts, and the ribs are the development of the frame work originally inserted after the completion of the hull of the canoe or built up boat.

The earliest representations that we have as yet of Egyptian vessels carry us back, according to the best authorities, to a period little short of 2,000 years before Christ. Some of these are of considerable size, as is shown by the number of rowers, and by the cargo, consisting in many cases of cattle. But the development of the ship and of the art of navigation clearly belongs to the Phœnicians. It is tantalizing to find that the earliest and almost the only evidence that we have of this development is to be gathered from Assyrian representations. The Assyrians were an inland people, and the navigation with which they were familiar was that of the two great rivers, Tigris and Euphrates. After the conquest of Phœnicia they had knowledge of Phœnician naval enterprise, and accordingly we find the war galley of the Phœnicians represented on the walls of the palaces unearthed by Layard and his followers in Assyrian discovery. But the date does not carry us to an earlier period than 900–800 B.C. The vessel represented is a bireme war galley which is "aphract," that is to say, has the upper tier of rowers unprotected and exposed to view. The apertures for the lower oars are of the same character as those which appear in Egyptian ships of a much earlier date, but without oars.

It is, however, to the Greeks that we must turn for any detailed account of these inventions. The Homeric vessels were aphract and not even decked throughout their entire length. They carried crews averaging from fifty to a hundred and twenty men, who, we are expressly told by Thucydides, all took part in the labor of rowing, except perhaps the chiefs. The galleys do not appear to have been armed as yet with the beak, though later poets attribute this feature to the Homeric vessels. But they had great poles used in fighting, and the term employed to describe these (*ναύμαχα*) implies a knowledge of naval warfare. The general characteristics are indicated by the epithets in use throughout the *Iliad* and the *Odyssey*. They present a type parallel in the history of the shipping of the Mediterranean with that of the vikings' vessels of the North Sea.

On the vases, the earliest of which may date between 700 and 600 B.C., we find the bireme with the bows finished off into a beak shaped as the head of some sea monster, and an elevated forecastle with a bulwark evidently as a means of defense. The craft portrayed in some instances are evidently pirate vessels, and exhibit a striking contrast to the trader, the broad ship of burden (*φορτῒς εὐρεία*), which they are overhauling. The trireme, which was developed from the bireme and became the Greek ship of war (the long ship, *ναῦς μακρα, navis longa par excellence)*, dates, so far as Greek use is concerned, from about 700 B.C. according to Thucydides, having been first built at Corinth by Aminocles. The earliest sea-fight that the same author knew of he places at a somewhat later date, 664 B.C., more than ten centuries later than some of those portrayed in the Egyptian tomb paintings.

The trireme was the war ship of Athens during her prime, and though succeeded and in a measure superseded by the larger rates—quadrireme, quinquereme, and so on, up to vessels of sixteen banks of oars (*inhabilis prope magnitudinis*)—yet, as containing in itself the principle of which the larger rates merely exhibited an expansion, a difference in degree and not in kind, has, ever since the revival of letters, concentrated upon itself the attention of the learned who were interested in such matters.

The Romans, who developed their naval power during the First Punic War, were deficient in naval construction till they learnt the art from their enemies the Carthaginians. They copied a quinquereme which had drifted onto the coast, and, with crews taught to row on frames set up on dry land, manned a fleet which we are told was built in sixty days from the time the trees were cut down. After the Punic War, in which the use of boarding tactics gave the Romans command of the sea, the larger rates—quinqueremes, hexiremes, octiremes—continued in use until at Actium the fate of the big vessels was sealed by the victory of the light Liburnian galleys. The larger classes, though still employed as guardships for some time, fell into disuse, and the art of building them and the knowledge of their interior arrangements were lost.

It is not at present possible to trace in its successive stages the transition from the ancient ship of war to the madiæval galley. The sailing vessels of the time of the early Roman empire, such as that in which St. Paul suffered shipwreck or the great merchantman described by Lucian, were the direct precursors, not only of the mediæval merchant vessels, but also of the large sailing vessels which, after the invention of gunpowder, and the consequent necessity of carrying marine artillery, superseded the long low galleys propelled by oars. The battle of Actium gave the death-blow to the ancient type of vessels with its many banks of oars. The light Liburnian galleys which, though fully decked, were aphract, and, according to Lucan's testimony, had only two banks of oars, were biremes. This apparently became the type of Roman war galleys; and, though the old name trireme survived, its meaning became simply "man of war," and did not any longer imply three banks of oars. Light vessels were in vogue, and galleys with single banks of oars are common in the representations on coins and in such frescoes as survive, but trireme and quinquereme, etc., have vanished.

A cloud of obscurity rests on these, the dark ages of naval history. We know nothing of the character and composition of the fleet in which Ricimer defeated the Vandals in the fifth century of our era. Nor have we any details of the fleets of the Byzantine empire until the end of the ninth century, when a light is thrown upon the subject by the *Tactica* of the emperor Leo. This emperor, in giving his directions as to the constitution of his fleet, prescribes that dromones (*δρομώνες*)—that is, triremes—are to be got ready in the dockyards with a view to a naval engagement. The vessels are not to be too light or too heavy. They are to be armed with siphons for the projection of Greek fire. They are to have two banks of oars, with twenty-five rowers apiece, on each side. Some of the vessels are to be large enough to carry two hundred men; others are to be smaller, like those called galleys or one-banked vessels, swift and light.

The light thrown by the philosophic Byzantine on the naval construction and equipment of his time is but a passing flash. After the ninth century there is darkness again until the eleventh and twelfth centuries, when the features of the mediæval galley first begin to be visible. And here perhaps it is not out of place to say that it is necessary to distinguish between those imaginary representations of the antique in which painters, such as Tintoret, give fanciful arrangement to the oars of their galleys, so as to meet their ideas of bireme or trireme, and those that are historically faithful, and figure, perhaps in an ungainly and inartistic manner, the galleys of Venice and Genoa as they appeared in the Middle Ages. It must suffice to indicate here a few of the main characteristics in which the mediæval galley differs from the ancient, and exhibits the last development of man-power as applied to motion in vessels larger than the boats of the present day.

Upon the mediæval galley, which was essentially a one-banked galley (*μονόκροτον*), the use of the longer oar or sweep took the place of the small paddling oars of the ancient vessel. The increased length of the oar requiring for its efficiency greater power than one man could employ, led to the use of more than one man to an oar. The necessity therefore arose of placing the weight (or point at which the oar, used as a lever, worked against the thowl, and so pressed against the water, which is the fulcrum) at a greater distance from the force or man who moved the lever. This was gained by the invention of the apostis. Upon the hull of the mediæval galley was laid a framework which stood out on either side from it, giving on either side a strong external timber, running parallel to the axis of the vessel, in which the thowls were fixed, against which the oars were rowed. It will be readily understood how this arrangement gave a greater length inboard for the oar as compared with that of the ancient vessels, where the thowl stood in the aperture of the vessel's side or port-hole. On the inner side, rising inward toward the center line of the decks and inclining upward, were the banks or benches for the rowers, arranged *à la scalloccio*, who could each grasp the handle of the oar, moving forward as they depressed it for the feather, and backward for the stroke as they raised their hands for the immersion of the blade. The stroke no doubt was slower than that of the ancient galleys, but much more powerful.

SHIPBUILDING. Within the memory of the present generation shipbuilding, like many other arts, has lost dignity by the extended use of machinery and by the subdivision of labor. Forty years ago it was still a "mystery" and a "craft." The well-instructed shipbuilder had a store of experience on which he based his successful practice. He gained such advantages in the form and trim and rig of his vessels by small improvements, suggested by his own observation or by the traditions of his teachers, that men endeavored to imitate him, neither he nor they knowing the natural laws on which success depended. He had also a good eye for form, and knew how to put his materials together so as to avoid all irregularity of shape on the outer surfaces, and how to form the outlines and bounding curves of the ship so that the eye might be compelled to rest lovingly upon them. He was skilled also in the qualities of timber. He knew what was likely to be free from "rends" and "shakes" and "cups" which would cause leakage, and which would be liable to split when the bolts and treenails were driven through it; what timber would bear the heat of tropical suns without undue shrinking, and how to improve its qualities by seasoning; could foretell where and under what circumstances premature decay might be expected, and he could choose the material and adjust the surroundings so as to prevent it. Such men were to be found on all the seacoasts of Europe and on the shores of the Atlantic in America.

A great change came over the art when steam was introduced. The old proportions and forms so well suited for the speeds of the ships and for the forces impressed upon them were ill adapted for propulsion by the paddle, and still less so for propulsion by the screw. The further change from wood to iron and then to steel almost displaced the shipwright. Ships for commercial purposes may be said to be built now, so far as their external hulls are concerned, by draftsmen and boilermakers. The centers of the shipbuilding industry have changed.

But, while the art of shipbuilding has lost dignity, the science of naval construction has increased in importance. Naval construction in England has had the good fortune during the last quarter of a century to have not only a thriving industry but a home for research. Twenty-five years ago, when the high-pressure condensing engine was in its infancy, when shipbuilding steel was not, and armor-plated ships had not yet displaced the wooden line-of-battle ship, this home was founded. The Institution of Naval Architects may be fairly called the home for research in naval construction. It owes its establishment mainly to four well-known men—John Scott Russell, Dr. Joseph Woolley, Lord Hampton, for many years its honored president, and Sir Edward Reed, its first secretary. It has published every year a volume of *Transactions* recording the experience of all the shipbuilders and marine engineers in England. These *Transactions* contain also valuable contributions from French, Italian, German, and other eminent constructors and engineers.

Shortly after the foundation of the Institution one of its members, Mr. William Froude, set up an experimental establishment at Torquay, under the auspices and with the assistance of the Admiralty. The object was to submit to experiment various proportions and forms of ships in model in order to compare the relative resistances in the same model at various speeds, and in different forms and proportions at equal speeds.

This law is in accordance with the old rule that the resistance varies as the square of the velocity, and also as the area of the surface exposed to resistance. For example, if the surface of the water surrounding a ship 160 feet long, traveling at 10 knots an hour, were modeled together with the ship, on any scale, the model would equally represent, on half that scale, the water surface surrounding a ship of similar form 320 feet long, traveling at 14.14 knots an hour; or again, on 16 times that scale, the water surface surrounding a model of the ship 10 feet long, traveling at 2½ knots. Experiment has abundantly confirmed this proportion as to the similarity of waves caused by similar forms traveling at corresponding speeds.

The vessel tried by Mr. Froude for confirming the law of comparison was H.M.S. *Greyhound* of 1,157 tons. She was towed by H.M.S. *Active*, of 3,078 tons, from the end of a boom 45 feet long, so as to avoid interferences of "wake." It was found to be possible to tow up to a speed of nearly 13 knots. The actual amount of towing strain for the *Greyhound* was approximately as follows:—at 4 knots, 0.6 ton; at 6, 1.4 tons; at 8, 2.5 tons; at 10, 4.7 tons; and at 12, 9.0 tons.

Comparing the indicated horse-power of the *Greyhound* when on her steam trials and the resistance of the ship as determined by the dynamometer, it appears that, making allowance for the slip of the screw, which is a legitimate expenditure of power, only about 45 per cent. of the power exerted by the steam is usefully employed in propelling the ship, and that the remainder is wasted in friction of engines and screw and in the detrimental reaction of the propeller on the stream lines of the water closing in around the stern of the vessel.

The changes which have come about in materials and modes of construction within the last fifty years have been most remarkable. The first steamer built expressly for regular voyages between Europe and America was not built until 1837. Doctor Lardner stated at about this date: "We have as an extreme limit of a steamer's practicable voyage, without receiving a relay of coals, a run of about 2,000 miles." The *Great Western*, built by Patterson of Bristol, and engined by Maudslay of London, under the superintendence of Sir I. K. Brunel, was the first such ship, and she was launched July 19, 1837. She was 212 feet long between the perpendiculars, 35 feet 4 inches broad, and had a displacement of 2,300 tons. She was propelled by paddles. Iron vessels were built early in the present century for canal service, then for river service, and later for packet service on the coasts. In about the year 1838 iron vessels of small dimensions were built for ocean service. The largest iron vessel built up to 1841 was less than 200 feet long. In 1843 we get for the first time the ocean-going steamship in its present form, built of iron, and propelled by the screw. This was the *Great Britain*, 286 feet long, projected and designed by Brunel. He entered with equal boldness on another innovation, in 1850, viz., the use of very large dimensions on the ground of economy of power. It was not until 1852 that he had the opportunity to put these views forward in a way to satisfy him. Of the different sizes of vessels discussed before the design was finally settled for the *Great Eastern*, the dimensions were: Length, 680 feet; beam, 83 feet; mean draft, about 25 feet; screw engine, indicated horse-power, 4,000, and nominal horse power, 1,600; paddle, indicated horse-power, 2,600, and nominal horse-power, 1,000; to work with steam 15 pounds to 25 pounds; speed of screw, 45 to 55 revolutions; paddle, 10 to 12.

The *Great Eastern*, produced by the joint skill of Brunel and Scott Russell, remains in advance of present practice, although she has served as a model for the best of it. Her great size rendered it possible to give to her an amount of security against fatal injury to her hull which cannot be attained in smaller ships. It is a mistake to suppose that large ships are less secure than small ones. The large ship can receive without inconvenience a wound which would be fatal to a small one, and the possibilities of attaining high speed increase with the size.

The question of bulkheads, on which Brunel insisted so much in this ship, is one which underlies all questions of construction. If the number of bulkheads in ships were increased as they ought to be, the numbers and sizes of the ribs or frames of the ship would be modified, and the system of construction generally would be changed, and become more like that of the *Great Eastern*. The question is therefore one which justifies some further consideration, so that it may be popularly understood.

Iron ships are commonly made with less than half their bulk out of water. If water enters such a ship, and the amount which enters does not exceed in bulk that portion of the bulk of the ship which is out of the water, and which will, when immersed, exclude the water, then the ship, if she does not turn over, will still float. If, however, the inflow cannot be stopped, but continues, the ship soon sinks.

There is, perhaps, no structure exposed to a greater variety of strains than a ship, and none in which greater risks of life and property are incurred. A thorough practical knowledge of the disturbing forces in action either to injure or to destroy the several combinations embraced in its structure is therefore most important. If the ship be in motion the same disturbing forces may still be in action, with others in addition which are produced by a state of motion. When a ship is at rest in still water, although the upward pressure of the water upon its body is equal to the total weight of the ship, it does not necessarily follow that the weight of every portion of the vessel will be equal to the upward pressure of that portion of the water directly beneath it, and acting upon it; on the contrary, the shape of the body is such that their weights and pressures are very unequal.

If the vessel be supposed to be divided into a number of laminæ of equal thickness, and all perpendicular to the vertical longitudinal section, it is evident that the after laminæ comprised in the overhanging stern above water, and the fore laminæ comprised in the projecting head also above water, cannot be supported by any upward pressure from the fluid, but their weight must be wholly sustained by their connection with the supported parts of the ship. The laminæ toward each extremity immediately contiguous to these can evidently derive only a very small portion of their support from the water, while toward the middle of the ship's length a greater proportionate bulk is immersed, and the upward pressure of the water is increased.

A ship floating at rest under the view just taken of the relative displacement of different portions of the body, if the weights on board are not distributed so that the different laminæ may be supported by the upward pressure beneath them as equally as possible, may be supposed to be in the position of a beam supported at two points in its length at some distance from the center, and with an excess of weight at each extremity. At sea it would be exposed to the same strain; and if supported on two waves whose crests were so far apart that they left the center and ends comparatively unsupported, the degree of this strain would be much increased. The more these two points of support approach each other, or if they come so near each other that the vessel may be looked upon as supported on one wave, or on one point only in the middle of her length, the greater will be the tensile strain on the upper portion, and the crushing strain on the lower portion of the fabric of the ship. A vessel whose weights and displacements are so disposed as to render her subject to a strain of this kind beyond what the strength of her upperworks will enable her to bear, will tend to assume a curved form.

The main remedy for these evils is in the strength of the deck and upperworks, and their power to resist a tensile strain. There is seldom a want of sufficient strength in the lower parts of the vessel to resist the crushing or compressing force to which it is subjected. The decks of vessels should not, therefore, be too much cut up by broad hatchways; and care should be taken to preserve entire as many strakes of the deck as possible. The tensile strength of iron can be brought to bear most beneficially in this respect. Though these are the strains to which a ship is most likely to be exposed, it by no means follows that there are no circumstances under which strains of the directly opposite tendency, when pitching, or otherwise, may be brought by recoil to act upon the parts. The weights themselves in the center of the ship may be so great that they may have a tendency to give a hollow curvature to the form, and it is therefore equally necessary to guard against this evil. When this occurs, the vessel is technically said to be "sagged," in distinction to the contrary or opposite change of form by being hogged. The weight of machinery in a wooden steam-vessel, or the weight or undue setting up of the main-mast, will sometimes produce sagging. The introduction of additional keelsons tended to lessen this evil, by giving great additional strength to the bottom, enabling it to resist extension, to which, under such circumstances, it became liable; and, as the strain upon the deck and upperworks becomes changed at the same time, they are then called upon to resist compression. When the ship is on a wind, the lee-side is subjected to a series of shocks from the waves, the violence of which may be imagined from the effects they sometimes produce in destroying the bulwarks, tearing away the channels, etc. The lee-side is also subjected to an excess of hydrostatic pressure over that upon the weather side, resulting from the accumulation of the waves as they rise against the obstruction offered to their free passage. These forces tend in part to produce lateral curvature. When in this inclined position, the forces which tend to produce hogging when she is upright also contribute to produce this lateral curvature. The strain from the tension of the rigging on the weather side when the ship is much inclined is so great as frequently to cause working in the topsides, and sometimes even to break the timbers on which the channels are placed. Additional strength ought therefore to be given to the sides of the ship at this place; and, in order to keep them apart, the beams ought to be increased in strength in comparison with the beams at other parts of the ship.

The principal plans of a ship are the "sheer" plan, giving in outline the longitudinal elevation of the ship; the "body" plan, giving the shape of the vertical transverse sections; and the "half-breadth" plan, giving the projections of transverse longitudinal sections. In addition to these the builder is furnished by the designer with elevations, plans, and sections of the interior parts of the ship, and of the framing and plating or planking.

The thicknesses or weights of all the component parts are specified in a detailed specification, in order that the ship when completed may have the precise weight and position of center of gravity contemplated by the designer. When completed ships float at a deeper draught than was intended, or are found to be more or less stable than was wished, this is nearly always due to additions and alterations made after the completion of the design. Where the designer is at liberty to complete the ship in accordance with the original intention there ought to be precise correspondence between the design and the ship. The term "laying off" is applied to the operation of transferring to the mold loft floor those designs and general proportions of a ship which have been drawn on paper, and from which all the preliminary calculations have been made and the form decided. A ship is generally spoken of as divided into fore and after bodies, and these combined constitute the whole of the ship; they are supposed to be separated by an imaginary athwartship section at the widest part of the ship, called the midship section or deadflat. The midship body is a term applied to an indefinite length of the middle part of a ship longitudinally, including a portion of the fore-body and of the after-body. It is not necessarily parallel or of the same form for its whole length. Those portions of a wooden ship which are termed the square and cant bodies may be considered as subdivisions of the fore-bodies and after-bodies. There is a square fore-body and a square after-body toward the middle of the ship, and a cant fore-body and a cant after-body at the two ends. In the square body the sides of the frames are square to the line of the keel, and are athwartship vertical planes. In the cant bodies the sides of the frames are not square to the line of the keel, but are inclined aft in the fore-body and forward in the after-body. The reason for the frames in these portions of a wooden ship being canted is that, in these parts of the ship, the timber would be too much cut away on account of the fineness of the angle formed between an athwartship plane and the outline or water-line of the ship. The timber is therefore turned partially round till the outside face coincides nearly with the desired outline, and it is by this movement that the side of a frame in the cant fore-body is made to point aft, and in the cant after-body to point forward. In wooden ships the term "timbers" is sometimes applied to the frames only, but more generally to all large pieces of timber used in the construction.

The keel, in the United Kingdom at least, is generally made of elm, on account of its toughness, and from its not being liable to split if the ship should take the ground, though pierced in all directions by the numerous fastenings passing through it. The rabbet of the keel is an angular recess cut into the side to receive the edge of the planks on each side of it. The keel is connected forward to the stem by a scarph, sometimes called the boxing scarph, and aft to the stern-post by mortise and tenon. The keelson is an internal line of timbers fayed upon the inside of the floors directly over the keel, the floors being thus confined between it and the keel. Its use is to secure the frames, and thus give strength to the ship to resist extension lengthways, and to prevent her hogging or sagging.

The floors in the government service were carried across the keel with a short and long arm on either side alternately, so as to break joint, and between the frames the space was filled in solid. Longitudinal pieces of timber are worked round the interior of a ship for the purpose of receiving the ends of the beams of the several decks; they are called shelves, and are of the greatest importance, not only for this purpose, but also as longitudinal ties and struts. The beams of a ship prevent the sides from collapsing, and at the same time carry the decks.

The plank, or skin, or sheathing of a ship, both external and internal, is of various thicknesses. A strake of planking is a range of planks abutting against each other, and generally extending the whole length of the ship. The upper strakes of plank, or assemblages of external planks, are called the sheer-strakes. The strakes between the several ranges of ports, beginning from under the upper-deck ports of a three-decked ship in the British navy, were called the channel wale, the middle wale, and the main wale. The strake immediately above the main wale was called the black strake. The strakes below the main wale diminished from the thickness of the main wale to the thickness of the plank of the bottom, and were therefore called the diminishing strakes. The lowest strake of the plank of the bottom, the edge of which fits into the rabbet of the keel, is called the garboard strake.

Plank is either worked in parallel strakes, when it is called "straight-edged," or in combination of two strakes, so that alternate seams are parallel. In top and butt strakes the intention is, by having a wide end and a narrow end in each plank, to approximate to the growth of the tree, and to diminish the difficulty of procuring the plank. The shift of plank is the manner of arranging the butts of the several strakes. In the ships of the British navy the butts were not allowed to occur in the same vertical line, or on the same timber, without the intervention of three whole strakes between them.

The decks of a wooden ship must not be considered merely as platforms, but must be regarded as performing an important part toward the general strength of the whole fabric. They are generally laid in a longitudinal direction only, and are then useful as a tie to resist extension, or as a strut to resist compression. When the decks are considered as a tie, the importance of keeping as many strakes as possible entire for the whole length of the ship must be evident; and a continuous strake of iron or steel plates beneath the decks is of great value in this respect. The straighter the deck, or the less the sheer or upward curvature at the ends that may be given to it, the less liable will it be to any alteration of length, and the stronger will it be. When the planks are fastened, the seams or the intervals between the edges of the strakes are filled with oakum, and this is beaten in or caulked with such care and force that the oakum, while undisturbed, is almost as hard as the plank itself. If the openings of the seams were of equal width throughout their depth between the planks, it would be impossible to make the caulking sufficiently compact to resist the water. At the bottom edges of the seams the planks should be in contact throughout their length, and from this contact they should gradually open upward, so that, at the outer edge of a plank ten inches thick, the space should be about $\frac{10}{16}$ of an inch, that is, about $\frac{1}{16}$ of an inch open for every inch of thickness. Bad caulking is very injurious in every way, as leading to leakage and to the rotting of the planks themselves at their edges. The preliminary work thus described having been completed the ship is launched, her construction and equipment concluded, and she is ready for sea.

The merchant ship is badly provided against fatal damage by collision, or by a blow delivered in any manner by which water is admitted into the ship. The propelling machinery of these ships and their steering apparatus are also dangerously exposed to artillery fire. Excepting torpedo boats, the ship of war of any size has its propelling machinery either under water or under cover of armor, and in a great number of cases there is either protection for the steering apparatus or there are two propellers. The approximation toward war-ship arrangements which is needed in the merchant-ship is the adoption of more than one screw and of greater breadth of ship, so that defenses round machinery may be created in time of war. Both these changes in merchant-ship practices are demanded also by mercantile interests. The increase in breadth amidships would greatly reduce the risk of foundering in collisions and give more spacious accommodation amidships. Such increase when accompanied by fine ends is also favorable to speed.

In the ships-of-war of the last century no attempt was made to employ armor on the sides or to prevent the passage of projectiles and water into the holds by means of a protecting deck. There was a deck just below the water-line, but it had no protective qualities. When screw propulsion was introduced into these ships, and it was found practicable to keep the engines and boilers under water, it would have been possible to place a deck over the machinery and beneath the water, which would have greatly added to the security of the engines, boilers, and magazines. The space above this deck might also have been so subdivided into compartments as to have protected the buoyancy and stability of the ship against the immediately fatal results of the invasion of water. The protection of the buoyaucy and stability by these means would not have been absolute, in the sense of making the ship safe, but it would have been of the utmost value as compared with ships, otherwise similar, but having no such protection.

Thirty years passed between the date when screw-propeller engines were placed beneath the water-level in ships of war and that at which a committee on designs, under the presidency of Lord Dufferin, proposed to place such a covering deck over them, or to construct a water-line raft-body. In 1878 a raft-deck was introduced into the *Comus* class of corvettes of 2,380 tons displacement, a class which was regarded as unarmored. Since that date the raft-deck has been adopted in a more or less complete form in nearly all classes of unarmored ships in the English navy.

The point now reached in all navies is that the broadside iron-clad with ports cut through an armored side, as invented in France by M. Dupuy de Lôme, and copied by every power, is obsolete. Guns must be worked singly or in pairs on revolving turn-tables, each turntable being surrounded by an armored tower, forming the loading chamber or protecting the mechanism. The side armor protecting the buoyancy, stability, machinery, and magazines, although not introduced for that purpose originally, is retained in France for very large ships, is given up in Italy in favor of a raft-body, and is retained partially in England and Germany in conjunction with a raft-body.

The trend of opinion now seems to be that the armor of protection above described scarcely furnishes the quality of protection needed. To meet the requirements of the latest designs of ships of war they must be so constructed as to be able not only to offer and resist attacks, but be possessed of superior speed and unsurpassed sea-going qualities. Of late years so many ships have been armored in the expectation that they would thereby be made invulnerable and failed to even remotely equal such expectations, that the conviction is forcing itself upon ship-builders and ship-owners that wrought iron armor must be abandoned.

The propulsion of ships by sails differs from the drifting of bodies in the air before the wind in a most important respect. Ships may drift or sail in the direct course of the wind, and they will then differ from air-borne bodies only in the comparative slowness imposed by the resistance of the water. Ships having the same length as breadth, or rather opposing the same form and area to side progress as to forward progress could never do other than sail before the wind. No disposition of canvas could make them deviate to the right or left of their course to leeward. But by an alteration of form giving them greater length than breadth, and greater resistance to motion sideways than to motion endwise, they came to possess the power of being able not only to sail to the right or left of the course of the wind, before the wind, but also to sail toward the wind. The wind can be made to impel them toward the point from which it is blowing by means of the lengthened form acted on by the resistance of the water.

The first vessel in which steam was applied as the motive power was built by Robert Fulton in 1807 and named the *Clermont*. She plied on the Hudson river. The first steam vessel built in Europe was in 1811; she was named the *Comet*.

The *Comet* was the first steam-vessel built in Europe that plied with success in any river or open sea. In 1838 the *Sirius* and *Great Western* commenced the regular Atlantic passage under steam. One year earlier (1837) Captain ERICSSON (*q.v.*), a scientific veteran who died March 8, 1889, towed the Admiralty barge with their lordships on board from Somerset House to Blackwall and back at the rate of ten miles an hour in a small steam vessel driven by a screw.

The screw did not come rapidly into favor and it was not until 1842 that a naval vessel was built with a screw. This vessel, first called the *Mermaid* and afterward the *Dwarf*, was designed and built by the late Mr. Ditchburn for the British navy. In 1841–3 the *Rattler*, the first ship-of-war propelled by a screw, was built for and by the British Admiralty under the general superintendence of Brunel. The engines of the *Rattler*, of 200 nominal horse-power, were made like the paddle-wheel engines of that day, with vertical cylinders and overhead crank-shaft, with wheel gearing to give the required speed to the screw. In 1845 the importance of the screw propeller for ships of war became fully recognized, and designs and tenders were invited from all the principal marine engineers.

The speed with which water can follow up the blades of a screw depends upon the head of water over it, but when the immersion is sufficient to exclude air, a head of water equivalent to thirty feet is supplied by the atmosphere, as has been pointed out by Prof. Osborne Reynolds. Experiments on the model of the Thornycroft screw have shown that the efficiency, which is as much as 70 per cent. when properly immersed, falls to about 50 per cent. when breaking the surface of the water. As a result of a change from a diameter of five feet ten inches to four feet six inches, the speed of the first-class torpedo boat was raised from eighteen to twenty knots, other conditions remaining the same.

There is no doubt that the stern is the best position for the screw. As a vessel passes through the water the friction imparts motion to the layer of water rubbing against the side. This layer increases in thickness toward the stern, so that, after the vessel has passed through, a considerable quantity of water is left with a motion in the same direction as the vessel. If the screw works in this water it is able to recover some of the energy which has been expended by the ship in giving it motion. The speed of this water, which Rankine estimates may be as much as one-tenth of the speed of the vessel, does not depend upon the form but upon the nature and extent of the surface. As it is a necessity that there should be such a wake, it is a distinct advantage to place the propeller in it and allow it to utilize as much as possible of the energy it finds there. It is important not to confound this water, which has had motion given to it by the side and bottom of the ship, with the wave of replacement, that is, the water filling in behind the ship. It should be the aim to interfere as little as possible with this motion, as such interference augments the resistance of the ship very considerably, even in well-formed ships. The propeller should therefore be kept as far away from the stern as possible.

The causes of loss of work incidental to propellers of different kinds may be summed up as follows: (1) Suddenness of change from velocity of feed to velocity of discharge. Propellers which suffer from this cause are the radial paddle-wheel and the common uniform pitch screw; while those which in varying degree avoid it are the gaining pitch screw, the feathering paddle-wheel, and the oar. (2) Transverse motion impressed on the water. Propellers which lose in efficiency from this cause are ordinary screw-propellers, which impart rotary motion, radial wheels, which give both downward and upward motion on entering and leaving the water, and oars, which impart outward and inward motion at the commencement and end of the stroke respectively. This loss is greatly reduced in the guide-propeller, as the guides take the rotary motion out of the water and utilize it in so doing. (3) Waste of energy of the feed water. This is experienced in the jet propeller as generally applied.

The foregoing article may be supplemented by a brief account of boatbuilding. The distinction between this and shipbuilding is not of a marked character, and cannot be sharply defined. But for all practical purposes the builder of a vessel without a deck, or but partially decked, and propelled partly by sails and partly by oars, or wholly by oars, may be defined as a boatbuilder.

The following is an outline of the method of construction. The designer lays down on paper the lines and body-plan of the craft, which are afterward traced full size on the floor of the drawing-loft. From these full-sized sections molds are made. The stem and stern posts, having been cut out to the shape designed, are tenoned into mortices in the keel. Two knees overlap, and bind the stem and stern posts to the keel, and are bolted with through bolts and clinched outside over a ring or washer. A stout batten of wood is then nailed between the stem and sternpost heads to connect them together, and a line is then stretched from stem to stern post to represent the water-line. The keel, stem, and stern posts being in position on the stocks, the stem and stern posts are then plumbed and secured by stays of wood. The rabbets in the keel, stem, and stern posts are then cut out with a chisel, after which the molds are put into their proper places, plumbed with the water-line and kept in position by stays. The planking is then proceeded with, strake after strake, and when the boat is planked up to the top strake the floors and timbers are put in. The floor extends across the keel and up to the turn of the bilge. They are fastened through the keel with copper or yellow metal bolts and to the planking with copper nails.

The timbers generally are about one inch by three-fourths inch, and are sawn out of a clean piece of American elm, then planed and rounded. After being steamed they are fitted into the boat, and as soon as each is in position, and before it cools, it is nailed fast with copper nails. The gunwale is next fitted, a piece of American elm about two inches square; a breast-hook is fitted forward, binding the gunwale, top strake, stern, and apron together; and aft the gunwale and top strake are secured to the transom by either a wooden or an iron knee. A waring or stringer, about three inches by three-fourths inch, of American elm, is then fitted on both sides of the boat, about eight to nine inches below the gunwale, on the top of which the thwarts or seats rest. The thwarts are secured by knees, which are fastened with clinch bolts through the gunwale and top strake and also through the thwart and knee. The boat generally receives three coats of paint and is then ready for service.

Ship-building in America dates back nearly three centuries. In 1607 the *Virginia* was built at the mouth of the Kennebec river, the first vessel constructed in the New World. The *Ourest* was built ten years later at New York, and in 1631 the *Blessing of the Bay* was floated at Medford, Mass. These were employed in the coasting or fishing trade, for it was not until 1640 that vessels for the transatlantic trade were launched in the American colonies. The success of these ventures was the beginning of an industry which was thereafter conducted with annually increasing volume until 1861, when the maritime career of the United States was at its height. In 1698 the registry and inspection of vessels was directed by law, and from that year until 1714 there were 1,332 vessels of American build registered at Boston. Ship-building on a comparatively more extended scale was carried on during the Revolutionary War, both by the government and by private individuals. At the close of hostilities many of these vessels engaged in the East Indian and other foreign trades. After the close of the war of 1812, packet ships, as they were called, were constructed to accommodate the immigration then commencing from Europe to America. Meanwhile, American ship-builders had abandoned the old models, substituting therefor new plans in the construction and equipment of ships that resolved the unwieldy, unsightly crafts of a former *regime* into patterns of beauty, speed and endurance previously unknown. Packet ships, which were commodious and luxuriously furnished, secured a monopoly of the passenger traffic in spite of the fact that the Cunards placed a line of steamships between New York and Liverpool as early as 1840. The packet ship was succeeded by the clipper, a vessel also built for speed and fully meeting expectations in that behalf. Clipper ships for passenger service were in turn succeeded by steam ships built on improved models and reënforced by every mechanical device and appliance invention could devise or money procure. The result was that American steamship lines defied competition and the record of the *Arctic*, *Baltic* and *Pacific* of the Collins line, and ships of other American lines, remained for years unbroken. They brought not only reputation to American builders, but orders from abroad for American bottoms. The vessels became larger and larger each year, and the ports of New York, Boston, Philadelphia and elsewhere at the East and South were selected as locations for the most extensive and comprehensively equipped shipyards in the world. Craft of every description and for every service were constructed, when the war of 1861 put a period to operations for the time being, though they have since been resumed on a scale altogether equal to that which ruled at the date referred to.

What is true with respect to the construction of ocean vessels and steamers applies with equal force to steamers and vessels constructed for inland river and lake navigation. The first steamer for the Mississippi river was built at Pittsburgh in 1811; she was named the *Orleans* and made about three miles an hour. Five years later the *Ontario*, the pioneer steamer of the lakes, was launched and completed at Sacketts Harbor, N. Y. Upon the eastern rivers steps were taken at an early day for the inauguration of a system of steamboat service with results apparent to-day in the magnificent, speedy, and absolutely secure steamers sailing the Hudson river, Long Island Sound and other prominent waterways. The Civil war interrupted river traffic, and railroads have in a large measure destroyed passenger traffic upon the lakes—yet the building of steamers and vessels has not been materially affected. Dry-docks are maintained at every port between Duluth and Buffalo, and at many of the cities on the Ohio, Missouri, and Mississippi rivers, and the annual business averages very large. The tendency of late years has been toward the construction of iron vessels for both sea and river service. Nor is it a recently acquired tendency, for iron vessels were constructed in New York more than fifty years ago. The war gave an impetus to their substitution for wooden vessels, especially in the construction of ships for the navy, and of late years iron vessels only are contracted for by the department. The same determination is also obtaining among builders for private venture upon both rivers and lakes.

Ship-building long since ceased to be merely an occupation in the United States, and became resolved into an art. The reputation of American artisans, not only for skill in the matter of construction but in respect to the quality of materials and reliable workmanship, leads that not alone of European contemporaries, but of those engaged in similar lines of endeavor the world over. Millions of dollars are invested in the business here, and the value of the annual product is proportionately great.

SHIPLEY, a town of England, in the West Riding of Yorkshire, is situated on the south bank of the Aire, in the neighborhood of a picturesque pastoral country, at the junction of the Leeds and Bradford railway with the Bradford, Skipton and Colne line, three miles north of Bradford. The church of St. Paul, an elegant structure in the Gothic style, erected in 1820, was altered and improved in 1876. The manufacture of worsted is the principal industry, and there are large stone quarries in the neighborhood. A local board was established in 1853. The population of the urban sanitary district (area 1,406 acres) in 1871 was 11,757 and in 1881 it was 15,093.

SHIPPING. The island of Britain (to the shipping of which the present historical notice is mainly restricted) is well fitted to serve as a commercial depot, both by the number of its natural harbors and by the variety of its products. There is evidence that Phœnician traders visited it for tin, and in after times it served as one of the granaries of the Roman empire.

Though the Angle and Saxon tribes were doubtless skilled both in shipbuilding and in the management of their vessels at the time when they conquered Britain, these arts had greatly decayed during the four centuries that elapsed before the time of Alfred, who endeavored to improve on existing models (*Eng. Chron.*, 897). Hence the necessity of resisting the Danes, with the subsequent fusion of Danish and other elements in our nationality, may be taken as marking the period when English shipping had its rise. Apart from incidental notices of communication with other lands, there is clear evidence, from the early English laws, of efforts to encourage commerce, particularly in the status which was accorded to traders and the protection afforded to merchant ships.

The steady development of English shipping during the Norman and early Plantagenet reigns may be inferred from the more frequent intercommunication with the Continent and the many evidences of the increasing importance of the commercial classes and trading towns. In the time of Edward III. the shipping interest suffered a temporary check from the removal of the staple to England, a step which was taken with the view of attracting foreign merchants to visit England (1353). This policy, however, was soon reversed, and the reign of that monarch was on the whole favorable to the development of shipping.

Considering the interest which all the Tudor monarchs showed in developing shipping, and the proverbial boldness and enterprise of the Cabots, Raleigh, Drake, and other sailors, it is remarkable that England obtained so little footing at first in the new lands which were discovered by Columbus (1492) or along the route that was opened up by Vasco da Gama (1496). Eventually she inherited much of the commercial empires of Spain, Portugal, Holland, and France, but there was still comparatively little permanent acquisition, or establishment of trading factories, at the close of the sixteenth century. The African Company and others were failures, but there were many which had a long and successful career. The Levant Company was established in 1581, and had factories at Smyrna. The Eastland Company traded with the Baltic; it was established in 1579, and had factories in Prussia. The Hudson's Bay Company is much more recent, and only dates from 1670. But by far the greatest of these undertakings was the East India Company, which was founded in 1600, and which, after a long struggle with commercial rivals at home and Dutch competitors abroad, attained at length to the sovereignty of a large empire.

The formation of these large companies for the purpose of undertaking long voyages marks a great revolution in the shipping of the country. Considerable progress had also been made both in the art of sailing and in the building of ships. Both Elizabeth and Charles offered bounties for the building of larger craft (100 and 200 tons); in 1597 800 tons was the largest vessel that an English yard turned out. The legislature also was most assiduous in endeavoring to encourage this industry. But the fundamental principle of this system of commercial policy lay in the connection which was felt to exist between trade and industry. Trade, it was said, stimulated industry by providing a new market for its products. If two countries trade together, each will stimulate the trade of the other to some extent, but, if England buys raw products from Portugal and Portugal buys manufactured cloth from England, then the orperation of trade between them is such that Portugal stimulates English industry and sets English labor in motion to a far larger extent than English consumption stimulates that of Portugal; it is believed that this relative stimulus might be detected by examining the balance of trade, and that, if by an ingenious adjustment of duties the balance could be kept in her favor, the trade would be benefiting England more than it stimulated the progress of her possible rivals.

It is unnecessary to attempt to illustrate in detail the application of these principles; it only remains to add that, whether in spite of these regulations or because of them, the shipping of England increased vastly during the eighteenth century. This was partly due to the greater facilities which were granted for procuring capital for trading ventures. The practice of trading on borrowed capital, and of obtaining temporary loans from goldsmiths, was common enough all through the seventeenth century, but the development of the banking system and the new forms of credit which thus became available gave still greater scope to the enterprising shipper. The full fruits of the new power were only shown, however, in the beginning of the eighteenth century, when the rivalry of the Old and New East India Companies and the story of the Darien expedition and the South Sea Bubble show how willing the British public were to pour their capital into trading undertakings. Among the companies which were started about this period there were two which have exercised a most salutary influence on British shipping. The Royal Exchange Assurance (6 Geo. I. c. 18) and the London Assurance revolutionized the whole system of marine assurance, and did so much to relieve skippers from the losses they suffered through the risks of commerce as to give considerable encouragement to the business. The plantations were developing into important settlements; the British merchant had outdone his Dutch rivals; and the East India Company was pursuing its course of progress in the East. There can be no wonder that, with so many opportunities for trading, and such new facilities for obtaining capital and assuring against risk, the shipping of the country developed during the eighteenth century. It is unnecessary to dwell on the shocks it received at the time when the American colonies asserted their independence (27 and 28 Geo. III.) or in the life and death struggle of the Napoleonic wars. The difficulty of recasting the restrictive system under which English merchants plied their trade was very great, and when it broke down in regard to America and Ireland (20 Geo. III. cc. 6, 10) it was becoming apparent that its days were numbered. The doctrines preached by Adam Smith soon began to bear fruit; the practical difficulty of regulating commerce rendered politicians more willing to let it regulate itself; and the controversy between the exclusive companies and the interlopers or independent merchants once more came to the front. It was during the reign of George IV. that the old system was practically abandoned and that the greater part of the old companies were dissolved, and trade to all parts of Africa, to the Levant, and to China became open to all British subjects.

It became still more obvious that the old policy of regulating the commerce of the country in the supposed interests of its power was being abandoned when Huskisson reformed the tariff in 1825. The measure he succeeded in carrying was not so thoroughgoing as the one he proposed, but its principle was that the customs duties should be levied for revenue objects only, and not with the view of maintaining British merchants in one particular employment of their capital. Later the repeal of the corn laws (1846) and navigation laws (1849) removed the last vestiges of the old commercial policy which had ruled over the development of British shipping almost from the earliest times, but which had been steadily and systematically pursued for three hundred years.

It is impossible to get satisfactory data for a comparison of the relative importance of English and foreign shipping for a long period; but it may be assumed that the shipping of the Italian republics and of the Hanse League excelled that of England during the Middle Ages, that in the sixteenth century Spain was far ahead of her when she could send such fleets to the West and fit out a Spanish Armada, and that in the seventeenth and eighteenth centuries respectively England was much in the same position as the great rivals—Holland and France—with which she had to compete so keenly. We may compare the present position and the relative growth of tonnage during the last century, so far as figures are available for the purpose:—

	1790.	1880.		1790.	1880.
Engl'nd	1,511,411	6,574,513	France..	....	989,128
Spain. .	....	557,320	Holland	....	349,000
Italy. . .	....	1,000,000	U. S....	502,146	4,000,000
Germ'y.	....	1,300,000			

The following aggregates show the growth of the tonnage of British shipping:—in 1588, 12,500 tons (excluding fishing boats); in 1770, 682,811 (England and Scotland); in 1791, 1,511,401 (including colonies); in 1830, 2,199,959 (excluding colonies); in 1840, 2,768,-262; in 1850, 3,565,133; in 1860, 4,658,687; in 1870, 5,690,789; in 1880, 6,574,513.

See Macpherson, *Annals of Commerce;* Lindsay, *History of Merchant Shipping.* For earlier periods see Schanz, *Englische Handels-Politik*, and for later periods Leone Levi, *History of British Commerce.*

SHÍRÁZ, a celebrated city in Persia, capital of Fars, is situated 29° 36′ 30″ N. latitude, and 52° 32′ 9″ E. longitude, in a high plain or valley more than twenty miles long, and less than half as broad, and is approached on the south from the sea, a distance of 170 miles, through lofty mountain passes reaching some 7,000 feet above the level of the waters of the Persian Gulf. On the north the approach is also through chains of mountains separating the plains of Shíráz from the valley of the Marv Dasht, intersecting which is the Band Amír river, more poetically than accurately described in *Lalla Rookh*. At Kodiyan, a few miles to the northwest of Shíráz, is the source of another river, which, crossing the high road south of the town under the name of the "Kára Agatch," falls into the sea about seventy miles below Bushahr (Bushire), after a tortuous course of 300 miles. The most noted product of Shíráz is its wine, on the merits of which, however, there is much difference of opinion from outside judges. Shíráz is, moreover, famous for inlaid work (wood and metal) called *khátam bandi* (from *khátam*, a seal). The population of the city is estimated under 30,000. The ordinary diseases are intermittent fever, diarrhœa, dysentery, typhoid, guinea-worm, cholera, diphtheria, smallpox, and ophthalmia.

SHIRE. An English name for COUNTY, (*q. v.*)

SHIRLEY, a town of Hampshire, consists chiefly of comfortable houses occupied by persons in business in Southampton (two miles southeast), of which it is practically a suburb. The urban sanitary district of Shirley, formed in 1853, was extended by an Act which came into operation September 29, 1881, the name being also changed to Shirley and Freemantle. The population of the old district (area, 1,198 acres) in 1871 was 5,339, and in 1881 it was 7,856. The population of the new district (area, 1,392 acres) in 1871 was 9,909, and in 1881 it was 12,939.

SHIRLEY, JAMES, dramatist, whose career of playwriting extended from 1625 to the suppression of stage plays by parliament in 1642. Born in London in 1596, he had been educated for a profession—at Merchant Taylors' school, St. John's college, Oxford, and Catherine Hall, Cambridge. The church was his destination, but he turned Roman Catholic, and made a living for two years as a schoolmaster. His first play, *Love Tricks*, seems to have been accepted while he was teaching at St. Albans, and for eighteen years from that time he was a prolific writer for the stage, producing more than thirty regular plays, tragedies, and comedies, and showing no sign of exhaustion when a stop was put to his occupation by the Puritan edict. He died in 1666. His chief plays were—*Love Tricks*, a comedy, 1625; *The Maid's Revenge*, a tragedy, 1626; *The Brothers*, a comedy, 1626; *The Witty Fair One*, a comedy, 1628; *The Wedding*, a comedy, 1628; *The Grateful Servant*, a tragi-comedy, 1629; *The Changes, or Love in a Maze*, 1632; *The Gamester*, a comedy, 1633; *The Example* (containing an imitation of Ben Jonson's *Humors*), 1634; *The Opportunity*, 1634; *The Traitor*, a tragedy (perhaps Shirley's best), 1635; *The Lady of Pleasure* (perhaps the best of his comedies), 1635; *The Cardinal*, a tragedy (an attempt to compete with Webster's *Duchess of Malfi*), 1641.

SHODDY. A mixture of rags and shreds of stockings, flannels and other worsted fabrics reduced to fragments, and used for cheap clothing.

SHOEMAKING. The simplest foot-protector is the sandal, which consists merely of a sole attached to the foot, usually by leather thongs. The use of this the archæologist can trace back to a very early period; and the sandal of plaited grass, palm fronds, leather, or other material still continues to be the most common foot-covering among Oriental races. Where climate demanded greater protection for the foot, the primitive races shaped a rude shoe out of a single piece of untanned hide; this was laced with a thong, and so made a complete covering. Out of these two elements—sole without upper and upper without sole—arose the perfected shoe and boot, which consist of a combination of both.

There are two main divisions of work comprised in ordinary shoemaking. The minor division—the making of "turn shoes"—embraces all work in which there is only one thin flexible sole, which is sewed to the upper while outside in and turned over when completed. Slippers and ladies' thin house boots are examples of this class of work. In the other division the upper is united to an insole and at least one outsole, with a raised heel. In this are comprised all classes, shapes, and qualities of goods, from shoes up to long-top or riding boots which reach to the knee, with all their variations of lacing, buttoning, elastic-web side gussets, etc.

Till within recent times shoemaking was a pure handicraft; but now machinery effects almost every operation in the art. On the factory system all human feet are treated alike; in the handicraft the shoemaker deals with the individual foot, and he should produce a boot which for fit, comfort, flexibility, and strength cannot be approached by the product of machinery.

The principal difficulties to overcome in applying machinery to shoemaking were encountered in the operation of fastening together the soles and uppers. The first success in this important operation was effected when means other than sewing were devised. In 1809 David Meade Randolph obtained a patent for fastening the soles and heels to the inner soles by means of little nails, etc. The lasts he used were covered at the bottom with plates of metal, and the nails, when driven through the inner soles, were turned and clinched by coming against the metal plates. To fix the soles to the lasts during the operation the metal plates were each perforated with three holes, in which wooden plugs were inserted, and to these the insoles were nailed. This invention may be said to have laid the foundation of machine boot-making.

Apart from sewing by machine or hand, three principal methods of attaching soles to uppers are in use at present. The first is "pegging" with small woden pins or pegs driven through outsole and insole, catching between them the edges of the upper. The second is the system of "riveting or clinching" with iron or brass nails, the points of the nails being turned or clinched by coming in contact with the iron last used. The third method, screwing, has come into extensive use since the standard screwing machine was introduced in America by the Mackay Association of Boston, Mass., and in Europe by the Blake & Goodyear Company of London. The standard screw machine, which is an American invention, is provided with a reel of stout screw-threaded brass wire, which by the revolution of the reel is inserted into and screwed through outsole, upper edge, and insole. Within the upper a head presses against the insole directly opposite the point of the screw, and the instant screw and head touch the wire is cut level with the outsole. The screw, making its own hole, fits tightly in the leather, and the two soles, being both compressed and screwed firmly together, make a perfectly water-tight and solid shoe.

The various forms of sewing-machine by which uppers are closed, and their important modifications for uniting soles and uppers, are also principally of American origin. But the first suggestion of machine sewing was an English idea. The first important step in the more difficult problem of sewing together soles and uppers by a machine was taken in the United States by Lyman R. Blake in 1858. Blake's original machine was very imperfect and was incapable of sewing round the toe of a shoe; but a principal interest in it coming into the hands of Gordon Mackay, he in conjunction with Blake effected most important improvements in the mechanism, and they jointly in 1860 procured United States patents which secured to them the monopoly of wholly machine-made boots and shoes for twenty-one years. On the outbreak of the Civil war in America a great demand arose for boots, and, there being simultaneously much labor withdrawn from the market, a profitable field was opened for the use of the machine, which was now capable of sewing a sole right round. Machines were leased out to manufacturers by the Mackay Company at a royalty of from ½ to 3 cents on every pair of soles sewed, the machines themselves registering the work done. The income of the association from royalties in the United States alone increased from $38,746 in 1863 to $589,973 in 1873, and continued to rise till the main patents expired in 1881, when there were in use in the United States about 1,800 Blake-Mackay machines sewing 50,000,000 pairs of boots and shoes yearly.

The range of machinery used in a well-equipped shoe-factory is very extensive, embracing machines for cutting leather, pressing rollers for sole leather, and presses with cutting-dies for stamping out sole and heel pieces. There are also, in addition to many kinds of sewing machines, blocking or crimping appliances for molding uppers or vamps, vamp-folding machines, eyeleting machines, lasting machines, trimming and paring machines for planing and smoothing the edges of soles and heels. For finishing there are scouring, sand-papering, and burnishing machines for the soles, and stamping machines for marks and monograms, with peg-cutting and nail rasping machines for smoothing, cleaning out, and dressing the surface of the insole. In short, there is not a single operation necessary in shoemaking, however insignificant, for which machinery has not been devised.

SHOES, HORSE. See HORSE-SHOEING.

SHOLAPUR, a British district of India, in the Deccan division of the Bombay presidency, with an area of 4,521 square miles, lying between 17° 13′ and 18° 35′ N. latitude and 74° 39′ and 76° 11′ E. longitude. It is bounded on the north by Ahmadnagar district, on the east by the nizam's territory and Akalkot state, on the south by Kaládgi district and some of the Patvardhan states, and on the west by Sátára and Poona districts and the states of Phaltan and Panth Pratinidhi. Except in Karmala and Barsi subdivisions, situated in the north and east, where there is a good deal of hilly ground, the district is generally flat or undulating; but it is very bare of vegetation, and presents everywhere a bleak, treeless appearance. The chief rivers are the Bhima and its tributaries—the Mán, the Nira, and the Sina—all flowing toward the southeast. The Great Indian Peninsular railway enters the district at Pomalvádi in the northwest corner and crosses it in a southeasterly direction, a distance of nearly 150 miles. Sholapur has recently been connected with a branch of the Southern Mahratta railway.

The population of Sholapur district in 1881 was 582,487 (294,814 males and 287,673 females). Hindus numbered 530,121, Mohammedans 43,967, and Christians 625. There are three towns with populations exceeding 10,000 each, viz., SHOLAPUR (*q. v.*), Pandharpur (16,910), Barsi (16,126). In 1883–84 there were 1,763,340 acres under cultivation, of which 22,282 were twice cropped, besides 325,987 acres of fallow or grass land. Joár, which forms the staple food of the people, occupied 923,706 acres, bajri 298,239, wheat 55,504, rice 25,027, pulses 185,528, and oil-seeds 147,914 acres. The produce of the district finds an easy outlet by the railway to Poona and Bombay. The chief exports are cotton, which comes from the nizam's dominions, oil, oil-seeds, ghi, turmeric, and cotton cloth; imports include salt, piece-goods, yarn, gunney bags, and iron ware. The chief industries are spinning, weaving, and dyeing. The silks and finer sorts of cotton cloth prepared in Sholapur bear a good name; blankets are also woven in large numbers. The gross revenue of the district in 1883–84 amounted to $647,145, of which the land-tax yielded $494,815.

SHOLAPUR, chief town and administrative headquarters of the above district, is situated in 17° 40′ 18′ N. latitude and 75° 56′ 38″ E. longitude, on the plain of the Sina. Its convenient situation between Poona and Haidarábád (Hyderabad) with a station on the Great Indian Peninsular railway, has made it the center for the collection and distribution of goods over a large extent of country. The town contained in 1881 a population of 59,890 (males 30,410, females 29,480).

SHOOTING for sporting purposes requires in the use of firearms two fundamental principles on which rests the attainment of dexterity. These are, first, that the weight of the weapon be such that the sportsman can carry and wield it with ease; and secondly—of still greater importance—that the weapon be so adapted to his chest, arm and eye that when it is raised and leveled in the act of taking aim it may be as part of his own body.

The next point in a gun is balance; that is, the metal in the barrels must be so apportioned and the general construction be so arranged that there is no tendency in the muzzle to droop at the moment of discharge, just when the faculties of the sportsman are absorbed in taking aim and his muscular energies are in abeyance. The gun should balance at a point a little in front of the trigger-guard. The center of gravity should also be low so that there may be nothing of what may be called "top-hamper," in other words, that his gun may not roll in his hand, but may keep on an even keel, as it were, while he is taking aim.

The caliber—a much disputed point—is, within the bounds commonly used, a question more of the capability of the sportsman to carry weight than one touching his effectiveness in the field. It has been plausibly argued that it matters little how narrow the caliber of a fowling-piece is, and that even gauge "35" (.510 inch) is wide enough. But for all common purposes the most useful caliber is the twelve-bore, if the weight is not under six and one-fourth pounds, or somewhat less for hammerless guns. When a less weight is required, "16" gauge (which in breech-loaders is really "15") is preferable. Caliber "20" belongs to toy-weapons, such guns also being uncertain in their delivery; and, as strong and effective "16" double-barreled guns can now be made weighing only six pounds, a smaller caliber can hardly be required, except under peculiar conditions.

The length of the barrels need not exceed thirty inches. Of late years there has been a run on what are termed "choke-bores" (see GUNMAKING). But unless the choking is most mathematically true the flight of the shot will not be coincident with the axis of the barrel or the line of aim, but will "train off" in some oblique direction; and this obliquity will also be more or less affected by any required modifications of the charge. A choke-bore, therefore, restricts its user to narrow conditions in loading it.

With a weapon that suits him, the sportsman will find that, on lifting it quickly to his shoulder, keeping both eyes open, and fixing them on any small object at some distance off, the barrels will be directly pointed toward that object without his having taken any slow or exact aim. To verify this, let him keep the gun in position and shut his left eye, when he will find still more plainly that his aim is true. The gun has been so constructed as to bring the rib between the barrels (for double-barreled guns are always understood) right in front of his line of vision. In other words, the barrels and stock have been so constructed, inclusive of the fine lines already referred to, that, so far as the required purpose is concerned, the whole piece may be said to form an integral part of his own body.

The attitude in taking aim should be free and upright, with the left foot somewhat advanced. The right elbow should never be raised to a horizontal level with the shoulder—a common but bad practice. The gun should be lifted directly upward, the butt-end just grazing the right front of the chest when reaching its final position, the eyes all the while looking fixedly upon the object.

The question how far the left hand should be extended in taking aim is much disputed, but is really of secondary consequence.

If the eye takes in all the rib of the gun when raised to the shoulder in position for firing, so that the full length of its surface is seen, the stock is too straight. If the rib is not seen at all, the stock is too crooked. When a stock is of the proper curve the eye will catch the rib about one-third of its length from the muzzle, *i.e.*, all the rib in front of that point will be visible, and all behind it out of sight. A straight stock is, however, preferable to a crooked one, which makes the gun shoot low—a bad fault. It is of first-rate importance that the delicate lateral setting of the stock, as distinguished from the perpendicular curve, should bring the center of the rib exactly into the line of sight.

In cleaning breechloaders, including the inside of the barrels, neither oil nor water should be used, but solely spirits of turpentine. The gun should never be laid aside on full-cock, as this weakens the mainsprings. As hammerless guns are necessarily on full-cock when taken down, the triggers should be drawn, but with the careful proviso that the points of the hammers strike upon a block of hard wood held firmly in front of them. The lock should never be snapped unless there is a discharged or "dummy" cartridge in the barrel. No hammer can be made, of any metal or form of construction, that will not probably crack if it falls without something in front less trying than the hard and impassive breech. On sea voyages and in damp climates the barrels should be kept from the atmosphere by inserting into them wooden rods covered with woollen cloth, and in such cases the free application of turpentine will be found invaluable. Failing these rods, each end may be closed with wadding or corks. For oiling the locks the finest chronometer oil should be used, and only applied in minute quantities to the points of friction, not over all; oil dries up and if applied copiously frustrates the desired purpose. Raw linseed oil, frequently rubbed into a stock, hardens and preserves it. Explorers and travelers, whose lives may depend on their firearms, may usefully strengthen the weakest part of every gun, the handle of the stock, by wrapping it tightly around with whip-cord.

The propriety of shooting with both eyes open is, if possible, more imperative in rifle-shooting than in shooting game, if rapidity is valued, as it must be. Firearms immediately followed the long bow and the cross-bow, and it has never been supposed that the archer discharged these with one eye closed. With both eyes open the "back sight" virtually becomes transparent, and forms no obstacle to the aim, while with one eye closed it certainly does, for, as the head and eyes must be kept fairly up in firing a shot gun, they must be kept well down in firing a rifle. The "express" rifle is the *chef-d'œuvre* of modern weapons, and when properly made will throw its bullet up to 200 yards without perceptible curve from one sight. This result is attained mostly by an inordinately large charge of powder to a light and partly hollow bullet (see GUNMAKING). The "pull" on the trigger should rather be a pinch than a direct backward pull, *i.e.*, the trigger should be pinched between the forefinger and the thumb which grasps the handle of the stock. If the sportsman has the presence of mind to inflate his chest with a long inhalation he will shoot all the better. There is a popular opinion that a single-barreled "express" shoots more truly than a double-barreled one. This is quite a mistake, unless the barrel of the former is made so thick and heavy at the muzzle (to prevent the metal quivering when the bullet leaves it) as to destroy the balance. In double-barreled rifles the one barrel braces up the other, and they are also so adjusted as to shoot parallel. This common error has probably arisen from confounding "express" with long-range match rifles, which are quite another thing. The .450 caliber is best adapted for deer and antelopes, .500 for mixed shooting, and .577 for dangerous animals. But for these and the great pachyderms a "12" gauge, throwing an explosive shell, is the most effective of all firearms, the larger "area" of the wound telling at once.

SHORE, Jane, mistress of King Edward IV., would have been unknown by name even to the studious antiquary but for the events which took place after the death of her royal paramour. She was born in London, and married before she was quite out of girlhood to a citizen named William Shore, who, though young, handsome, and well-to-do, never really won her affections; and thus she yielded the more readily to the solicitations of King Edward. Her husband on this abandoned her, and after Edward's death she became the mistress of Lord Hastings, whom Richard III., then duke of Gloucester, as protector during the minority of Edward V., suddenly ordered to be beheaded on June 13, 1483. So having got rid of Hastings he caused Jane Shore to be committed to prison and spoiled her house, and procured the bishop of London to put her to open penance at Paul's Cross for her vicious life. The penance certainly did not induce her to reform, for she immediately afterward became the mistress of the marquis of Dorset; and, what is still more extraordinary, next year, having been taken again into custody, and her husband, it may be presumed, being by that time dead, she so captivated the king's solicitor, Thomas Lynom, that he actually entered into a contract of marriage with her. Whether the marriage actually took place is not known. Jane certainly lived to the year 1513, when More wrote his history of Richard III., but how much later we cannot tell.

SHORTHAND, or Stenography, Tachygraphy, etc., is a term applied to all systems of brief handwriting which are intended to enable a person to write legibly at the rate of speech. England was the birthplace of modern shorthand, and at the present time there is no country in Europe, except perhaps Germany and German Switzerland, where the art is so extensively practiced as in England. The first impulse to its cultivation may possibly be traced to the Reformation. When the principles of that movement were being promulgated from the pulpit, a desire to preserve the discourses of the preacher naturally suggested the idea of accelerated writing. It is certainly striking that in the early systems so many brief arbitrary signs are provided to denote phrases common in the New Testament and Protestant theology. Up to the present time (1890) more than 500 professedly distinct systems of English shorthand have been published, and doubtless many more have been invented for private use. The first shorthand system worthy of the name which so far as is known, appeared in England is that of John Willis, whose *Art of Stenographie* (London, thirteen editions from 1602 to 1644) is substantially based on the common alphabet; but the clumsiness of his alphabetic signs, and the confused laborious contrivances by which he denotes prefixes and terminations, involving the continual lifting of the pen, would seem to render his method almost as slow as longhand. Of the 201 systems which intervene between J. Willis' and Isaac Pitman's phonography (1837) nearly all are based, like Willis', on the alphabet, and may be called a, b, c systems. But seven are, like phonography, strictly phonetic, viz., those by Tiffin (1750), Lyle (1762), Holdsworth and Aldridge (1766), Roe (1802), Phineas Bailey (1819), Towndrow (1831), and De Stains (1839). Of the 281 systems which have appeared since phonography a very large proportion are merely imitations of that system, or proceed on the same lines.

Each letter is designated by a straight line or curve (vertical, horizontal, or sloping), sometimes with the addition of a hook or loop. *C* and *q* are rejected, *k* being substituted for hard *c* and *q*, *s* for soft *c*. Signs are provided for *ch*, *sh*, *th*. *G* and *j* are classed under one sign, because in some words *g* is pronounced as *j*, as in *giant*, *gem*. Similarly each of the pairs *f*, *v* and *s*, *z* has only one sign. A few authors make the signs for *j*, *v*, *z* heavier than those for *g*, *f*, *s*. Some class *p* and *b*, *t* and *d*, each under one sign. The stenographic alphabet is therefore—*a*, *b*, *d*, *e*, *f* (*v*), *g* (*j*), *h*, *i*, *k*, *l*, *m*, *n*, *o*, *p*, *r*, *s* (*z*), *t*, *u*, *w*, *x*, *y*, *ch*, *sh*, *th*. Letters which are not sounded may be omitted. *Gh*, *ph* may be counted as *f* in such words as *cough*, *Philip;* but the *th* in *thing* is never distinguished from the *th* in *them*. Thus the a, b, c systems are largely phonetic with respect to consonant sounds; it is rather with regard to the vowels that they disregard the phonetic principle. No attempt is made to provide adequately for the many vowel-sounds of the language. Thus the signs for *like* and *lick*, for *rate* and *rat*, etc., are the same. In the case of vowel-sounds denoted by two letters, that vowel is to be written which best represents the sound. Thus in *meat* the *e* is selected, but in *great* the *a*. In some a, b, c systems, including the best of them (Taylor's), a dot placed anywhere does duty for all the vowels. This practice is, of course, a fruitful source of error, for *pauper* and *paper*, *gas* and *goose*, and hundreds of other pairs of words would, according to this plan, be written alike.

John Willis' system was largely imitated but hardly improved by Edmond Willis (1618), T. Shelton (1620), Witt (1630), Dix (1633), Mawd (1635), and Theophilus Metcalfe (1635). Rich's system (1646, twentieth edition 1792) was reproduced with slight alterations by many other persons, including W. Addy, Stringer, and Dr. Philip Doddridge (1799 and three times since). Locke, in his *Treatise on Education*, recommends Rich's system; but it is encumbered with more than 300 symbolical and arbitrary signs. In 1847 it was still used by Mr. Plowman, a most accomplished Oxford reporter.

In 1672 William Mason, the best shorthand author of the seventeenth century, published his *Pen pluck'd from an Eagle's Wing*. The alphabet was largely taken from Rich's. Initial vowels are written by their alphabetic signs, final vowels by dots in certain positions (*a*, *e* at the beginning; *i*, *y* at the middle; *o*, *u* at the end), and medial vowels by lifting the pen and writing the next consonant in those same three positions with respect to the preceding one. Mason employed 423 symbols and arbitraries. He was the first to discover the value of a small circle for *s* in addition to its proper alphabetic sign. In 1707 was published at Manchester a work by John Byrom, sometime fellow of Trinity College, Cambridge, entitled *The Universal English Shorthand*, distinguished for its precision, elegance, and systematic construction. Byrom had died in 1763. In 1786 was published *An Essay intended to establish a Standard for a Universal System of Stenography*, by Samuel Taylor (London). This system did more than any of its predecessors to establish the art in England and abroad. Equal to Byrom's in brevity, it is simpler in construction. No letter has more than one sign, except *w*, which has two.

The Universal Stenography of William Mavor (1780 and nine times since) is a very neat system, and differs from Taylor's in the alphabet and in a more definite method of marking the vowels. *A*, *e*, *i*, are indicated by commas, *o*, *u*, *y*, by dots, in three places with respect to a letter, namely beginning, middle, and end. Other systems by J. H. Lewis (1812) and Moat (1833) are still used to a small extent.

The vast mass of a, b, c systems are strikingly devoid of originality, and are mostly imitations of the few that have been mentioned. Nearly all may be briefly described as consisting of an alphabet, a list of common words, prefixes and suffixes expressed by single letters, a list of arbitrary and symbolical signs, a table showing the best way of joining any two letters, a few general rules for writing, and a specimen plate.

Pitman's phonography, on account of its enormous diffusion in Great Britain and the colonies, and in America, its highly organized and original construction, and its many inherent advantages, merits a more extended notice than has been given to the systems already mentioned. In 1837 Isaac Pitman, then teacher of a British school at Wotton-under-Edge and an excellent writer of Taylor's system, composed at the invitation of Samuel Bagster a short stenographic treatise of his own, which Bagster published under the title of *Stenographic Sound-Hand*. In 1840 a second edition appeared in the form of a penny plate bearing the title *Phonography*, the principal feature of the system being that it was constructed on a purely phonetic basis. The name of Bagster helped the enterprise, and the author was indefatigable in spreading the knowledge of his system by lectures and gratuitous teaching through the penny post, then just established.

The system has been warmly taken up in America, where it has been republished in more or less altered forms, especially by the author's brother Benn Pitman, and by Messrs. A. J. Graham, J. E. Munson, E. Longley, and Eliza B. Burns. A large number of periodicals lithographed in phonography are published in England and America.

Phonography has been adapted to several foreign languages, but not so successfully as Gabelsberger's German system. Mr. T. A. Reed's *French Phonography* (1882) is intended only for English phonographers who wish to report French speeches. Other adaptations to French are by A. J. Lawson and J. R. Bruce. A society for the adaptation of phonography to Italian was organized at Rome in 1883 by G. Francini, who has published his results (Rome, 1883, 1886). Phonography adapted to Spanish by Parody (Buenos Ayres, 1864) is practiced by half the stenographers employed in the senate and chamber at Buenos Ayres. It has been adapted to Welsh by R. H. Morgan (Wrexham, 1876), and to German by C. L. Driesslein (Chicago, 1884).

A considerable number of American systems, as well as systems based on Taylor's and Gurney's, were issued during the early days of the republic. Since the introduction of phonography into the United States in 1845, the dissemination of the art has gone steadily forward, and its use since 1880 has been greatly on the increase, shorthand being now taught in a large number of schools. American shorthand societies are very numerous, most of them having been formed since 1880. Two are devoted to the Stolzean system. Of the fourteen shorthand magazines which Mr. Rockwell enumerates eleven are phonographic.

In nine cases out of ten phonography will be found admirably adapted to the purposes of verbatim reporting. But to be legible it must be written with care. This necessity arises from its brevity and its use of light and heavy, halved and double-length strokes. Hence a clumsy scribe may find a longer system, such as Gurney's, answer his purpose better. A theoretical knowledge of most systems may be gained in a few hours. Pitman's method is not so easily acquired, but an intelligent person can master its details in a few weeks. Shorthand writing is, however, mainly a matter of practice. Few can make any considerable use of it with less than six months' assiduous practice. The average rate of public speaking is very slightly over 120 words a minute. Some speakers average 150. The slowest utterance is now and then exchanged for a rapid flow of words, and 180 to 200 words is no uncommon speed in certain styles of speech such as the conversational—a speed which many persons would never acquire. Most persons of average intelligence may by perseverance write with certainty at 150 words a minute. The best method of practice in the early period is to write a dictation from a book; in public speaking the frequent pauses help the writer to regain lost time.

Shorthand was first employed officially in the service of parliament in 1802, when a resolution was passed that "the evidence given before all committees inquiring into the election of members should or might be reported by a person well skilled in the art of writing shorthand." In 1813 a further resolution was passed by both houses that the official writer "should attend by himself or sufficient deputy when called upon to take minutes of evidence at the bar of this house or in committees of the same." The lucrative office of shorthand-writer to both houses of parliament is still held by the Gurney family. Of course most of the work is done by deputy. Some of the most efficient members of Messrs. Gurneys' staff are phonographers; others use Taylor's system. The amount of evidence given in the course of a tolerably long day's sitting may amount to 400 or 500 folios (seventy-two words make a folio), which would occupy from twelve to fifteen columns of the *Times* in small type. The whole must often be transcribed and delivered to the printers in the course of the night, and copies, damp from the press, are in the hands of the members and "parties" at the beginning of the sitting on the following day.

German.—C. A. Ramsay's *Tacheographia* (Frankfort, 1679, and several times afterward until 1743) was an adaptation of T. Shelton's English system. Mosengeil (1797) first practically introduced shorthand writing into Germany in an adaptation of the Taylor-Bertin method. F. X. Gabelsberger's *Anleitung zur deutsche Redezeichenkunst* (Munich, 1834) is the most important of the German systems. The method is based on modifications of geometrical forms, designed to suit the position of the hand in ordinary writing. Soft sounds have small, light, and round signs, while the hard sounds have large, heavy, and straight signs. The signs too are derived from the current alphabet, so that one can find the former contained in the latter. Vowels standing between consonants are not literally inserted, but symbolically indicated by either position or shape of the surrounding consonants, without, however, leaving the straight writing line. The proceedings of the chambers in Austria, Bavaria, Baden, Würtemberg, Saxony, Saxe-Weimar, Coburg-Gotha, Silesia, and the Rhine provinces are reported solely by writers of this method, and half the stenographers in the German reichstag use it. There are in Germany and Austria more than 540 societies containing over 20,000 members devoted to it. It is officially taught in all the middle class schools of Bavaria, Saxony, and Austria. It has been adapted to foreign languages to such an extent that legislative proceedings are reported by it in Prague, Agram, Pesth, Sophia, Athens, Copenhagen, Christiana, Stockholm, and Helsingfors. On Gabelsberger's system is based that of W. Stolze (1840). There are nearly 400 Stolzean associations with over 8,000 members. The system is officially used in the Prussian, German, and Hungarian parliaments, in the last two along with Gabelsberger's.

The earliest French system worthy of notice is that of Coulon de Thévenot (1777), in which the vowels are disjoined from the consonants. The methods practiced at the present day may be divided into two classes, those derived from Taylor's English system, translated in 1791 by T. P. Bertin, and those invented in France. The latter are (*a*) Coulon de Thévenot's; (*b*) systems founded on the principle of the inclination of the usual writing—the best known being those of Fayet (1832) and Sénocq (1842); and (*c*) systems derived from the method of Conen de Prépéan (five editions from 1813 to 1833). Prévost, who till 1870 directed the stenographic service of the senate, produced the best modification of Taylor. Of the forty writers in the official service of parliament twenty-two use Prévost's and those founded on it (all based ultimately on Taylor's), while ten employ methods based on Conen's.

The father of Spanish stenography was Don Francisco de Paula Marti, whose system, first published in 1803, still holds its ground against all rivals. The alphabet is a combination of Taylor's and Coulon's. By decree of November 21, 1802, a public professorship of shorthand was founded in Madrid, Marti being the first professor.

Marti's son carried his father's system to Portugal, where shorthand is still entirely unknown except in the parliament and the courts. Of the twenty reporters in the senate and chamber at Buenos Ayres ten use Pitman's phonography, six Marti's, and the rest Garriga's.

Italian translations and adaptations of Taylor's system succeeded one another in considerable numbers from Amanti (1809) to Bianchini (1871). Delpino's (1819) is the best. The Gabelsberger-Noe system (1863) is the only other which has gained many followers. Since 1885 the debates of the senate have been partly reported by the Michela stenographic machine with fair results. J. Reijner's Dutch method (1673) was an adaptation of Shelton's and Bussuijt's (1814) of Conen's system. Sommerhausen and Bossaert (1829) received prizes from the government for their productions. The twelve stenographers employed in the parliament use the system of Cornelis Steger (1867), president of the bureau, who translated Taylor's work and has written a history of shorthand. Gabelsberger's system was transferred to Dutch by Rietstap (1869) and Stolze's by Reinbold (1881).

Adaptations of Gabelsberger's method have come into use in the remaining countries of Europe, superseding all others.

Numerous mechanical reporting machines have been invented. They take as long to learn as a shorthand system, cannot easily be carried about, are liable to get out of order, and make a noise.

SHORTSIGHT. See Ophthalmology.

SHOSHONG, a town in the British protectorate of Bechuanaland, the chief settlement of the Eastern Bamangwatos, is situated in a glen at the foot of a range of Primary rocks on the Shoshon, a periodically flowing brook which flows eastward into the Limpopo or Uri river. It lies about 400 miles north of Kimberley, with which it was connected by road and telegraph under Sir Charles Warren's administration. Water is scarce, and the present king, Khama, has taken over a well dug by one of the traders, the use of which he permits on the payment of a water-rate of $5 per month per family. Altogether there are 7,000 to 8,000 native huts in Shoshong, and the population is estimated at from 15,000 to 30,000. The white inhabitants—mostly English traders—number about twenty.

SHOVEL, Sir Cloudesley, English admiral, was according to some accounts a native of Yorkshire, but the most commonly accepted statement is that he was born of poor parents about 1650 in Clay, a fishing village of Norfolk, where he was apprenticed to a shoemaker. Having run away to sea, he became cabin-boy on board a ship commanded by Sir Christopher Mynns. In 1674 he served as lieutenant under Sir John Narborough in the Mediterranean, where he burned four men-of-war under the castles and walls of Tripoli, belonging to the pirates of that place. In 1690 he convoyed William III. across St. George's Channel to Ireland; the same year he was made rear-admiral of the blue, and was present at the battle of Beachy Head, on July 10th. In 1692 he was appointed rear-admiral of the red, and joined Admiral Russel, under whom he greatly distinguished himself at La Hogue, having a principal share in burning twenty of the enemy's men-of-war. In 1702 he was sent to bring home the spoils of the French and Spanish fleets from Vigo, after their capture by Sir George Rooke, and in 1704 he served under Sir George Rooke in the Mediterranean. In January, 1705, he was named rear-admiral of England, and shortly afterward commander-in-chief of the British fleets. He coöperated in the capture of Barcelona along with the earl of Peterborough in 1705, and made an unsuccessful attempt on Toulon in October, 1707. When returning with the fleet to England his ship, the *Association*, at eight o'clock at night on October 22d, struck on the rocks near Scilly, and was seen by those on board the *St. George* to go down in three or four minutes' time, not a soul being saved of 800 men that were on board. The body of Sir Cloudesley Shovel was cast ashore next day, and was buried in Westminster Abbey.

SHOVELER, formerly spelt Shovelar, and more anciently Shovelard, a word by which used to be meant the bird now almost invariably called Spoonbill (*q.v.*), but in the latter half of the sixteenth century transferred to one hitherto generally, and in these days locally, known as the Spoon-billed Duck—the *Anas clypeata* of Linnæus and *Spatula* or *Rhynchaspis clypeata* of modern writers. All these names refer to the shape of the bird's bill, which has been thought sufficient to remove the species from the Linnæan genus *Anas*. Except for the extraordinary formation of this feature, which carries with it a clumsy look, the male Shoveler would pass for one of the most beautiful of this generally beautiful group of birds. His golden eye, his dark green head, surmounting a throat of pure white and succeeded by a breast and flanks of rich bay, are conspicuous; while his deep brown back, white scapulars, lesser wing-coverts (often miscalled shoulders) of a glaucous blue, and glossy green speculum bordered with white present a wonderful contrast of the richest tints, heightened again by his bright orange feet. On the other hand, the female, excepting the blue wing-coverts she has in common with her mate, is habited very like the ordinary Wild-Duck, *A. boscas*. The Shoveler is not an abundant species, and in Great Britain its distribution is local. It has not ordinarily a very high northern range, but inhabits the greater part of Europe, Asia, and America, passing southward, like most of the *Anatidæ* toward winter, constantly reaching India, Ceylon, Abyssinia, the Antilles, and Central America, while it is known to have occurred at that season in New Granada, and, according to Gould, in Australia. Generally resembling in its habits the other fresh-water ducks, the Shoveler has one peculiarity that has been rarely, if ever, mentioned, and one that is perhaps correlated with the structure of its bill. It seems to be especially given to feeding on the surface of the water immediately above the spot where Diving Ducks (*Fuligulinæ*) are employing themselves beneath.

Four other species of the genus *Spatula*, all possessing the characteristic light blue "shoulders," have bee described—one, *S. platalea*, from the southern parts of South America; a second, *S. capensis*, from South Africa, much lighter in color than the female of *S. clypeata;* a third and a fourth, *S. rhynchotis* and *S. variegata*, from Australia and New Zealand respectively—these last much darker in general coloration, and the male possessing a white crescentic mark between the bill and the eye, very like that which is found in the South American Blue-winged Teal (*Querquedula cyanoptera*), but so much resembling each other that their specific distinctness has been disputed by good authority. In these last two the sexual difference is well marked by the plumage; but in the South American and South African species it would seem that both male and female have much the same appearance, as is the case with so many species of the restricted genus *Anas*, though this cannot yet be asserted with certainty.

SHREVEPORT, the capital of Caddo parish, La., is located at the head of navigation on Red river, 700 miles by water from New Orleans. It is the terminus of the Texas and Pacific, of the New Orleans, Vicksburg and Shreveport and of the Shreveport and Texas railroads, and is a growing city. Steamboats ply regularly between Shreveport and New Orleans, Vicksburg, Memphis, and St. Louis, but the glory of the Mississippi river steamboat belongs rather to a past generation, and except for heavy freight the railroads have supplanted the steamer traffic. Shreveport, however, possesses exceptional advantages of location. Situated in the heart of the cotton growing region of northern Louisiana, it is one of the principal cotton markets in the country, and the second city in the State, enjoying an extensive trade and river commerce. From one to two hundred thousand bales of cotton are exported annually, besides large consignments of hides, wool and tallow. The city contains a court-house, cotton exchange, four banks, eleven churches, schools and academies, three daily and two weekly papers, the Tally opera house, and two or more public halls, several hotels and many stores. Among the public improvements is an iron bridge spanning Red river. It is 20 feet wide and 1,200 feet in length. The industries established include factories for lumber and cotton seed oil, carriages, sash, doors, and blinds, cotton gins, soap, ice, spokes and hubs, etc., in addition to foundries and machine shops, saw and planing mills, breweries, etc. The city was founded early in the thirties and incorporated in 1839, with a population of 4,600. In 1880 the population was 8,069, and in 1890 it was 11,979.

SHREW, a general term applied to the species of the family *Soricidæ*, order *Insectivora*, but in the British Isles more particularly to the common and to the lesser shrew, (*Sorex vulgaris*, L., and S. *pygmæus*, Pall.)

The common shrew is, in England at least, by far the commoner of the two. It is a small animal about the size of the common mouse, which it somewhat resembles in the shape of its body, tail, and feet. But here the resemblance ends, for, unlike the mouse, it possesses a remarkably long and slender muzzle, with prominent nostrils, which project far beyond the lower lip; the eyes are very small and almost concealed by the fur; the ears are wide and short, scarcely rising above the long hairs surrounding them, and are provided internally with a pair of deep folds, capable, when laid forward, of closing the entrance; the tail, which is slightly shorter than the body (without the head), is quadrangular in shape and clothed more or less densely with moderately long hairs, terminating in a short pencil (in old individuals these hairs become worn away, so that in some specimens the tail is almost quite naked); the feet are five-toed, the toes terminating in slender, acutely pointed, non-retractile claws. The dentition is very peculiar and characteristic; there are in all thirty-two teeth, tipped with deep crimson; of these twelve only (the number is characteristic, with one exception only, of the family) belong to the lower jaw; of the remaining twenty ten occupy each side of the upper jaw, and of these the first three, as they are implanted in the premaxillary bone, are termed incisors. The body is clothed with closely set, uniformly long fur, very soft and dense, varying in color from light reddish to dark brown above, rarely speckled over or spotted or even banded with white. The under surface of both the body and the tail is grayish; the basal four-fifths of all the hairs above and beneath are dark bluish gray; the hairs of the tail are less densely set and coarser. On each side of the body, at a point about one-third of the distance between the elbow and the knee, may be found, especially in the rutting season, a cutaneous gland covered by two rows of coarse inbent hairs. This gland secretes a peculiar fluid, on which the unpleasant cheesy odor of the animal depends, and which is evidently also protective, rendering it secure against the attacks of many predaceous animals.

S. Pygmæus.—The lesser shrew is much less abundant in England and Scotland, but comparatively common in Ireland, where the common shrew has not yet been found. It was said to differ in having the tail longer than the body (without the head), whereas in the common shrew the body (without the head) is longer than the tail, and in the last unicuspidate upper molar tooth being comparatively larger and more external than the other species.

The habits of both the common and the lesser shrew correspond. They live generally in the neighborhood of woods, making their nests under the roots of trees or in any slight depression, occasionally even in the midst of open fields, inhabiting the disused burrows of field-mice. They seek their food, which consists of insects, insect larvæ, small worms, and slugs, under dead leaves, fallen trees, and in grassy places. Like the mole, they are very pugnacious, and, if two or more are confined together in a limited space, they invariably fight fiercely, the fallen becoming the food of the victorious. The breeding season extends from the end of April to the beginning of August, and five to seven, more rarely ten, young may be found in their nests; they are naked, blind, and toothless at birth, but soon run about snapping at everything within reach.

The alpine shrew (*S. alpinus*, Schinz), restricted to the alpine region of Central Europe, is slightly longer than the common shrew, and differs from it conspicuously in its much longer tail, which exceeds the length of the head and body, in the color of the fur, which is dark on both surfaces, and in the large size of the upper and ante-penultimate premolar.

The water-shrew (*Crossopus fodiens*, Pall.), the third and last species inhabiting England, differs from the common shrew in being considerably larger, with a shorter and much broader muzzle, comparatively smaller eyes, and larger feet adapted for swimming—the sides of the feet and toes being provided with comb-like fringes of stiff hairs. This species resembles the otter in its aquatic habits, swimming and diving with great agility. It frequents rivers and lakes, making its burrows in the overhanging banks, from which, when disturbed, it escapes into the water. Its food consists of the different species of water-insects and their larvæ, small crustaceans, and probably the fry of small fishes. It is generally distributed throughout England, is less common in Scotland, but as yet it has not been recorded in Ireland.

The geographical range of the common shrew is exceedingly wide, extending eastward through Europe and Asia (north of the Himalayas) to North America. The lesser shrew extends concomitantly through Europe and Asia to Saghalin Island; and specimens of the water-shrew have been brought from different parts of Europe and from Asia as far east as the Altai range. Other species of red-toothed shrews are restricted chiefly to North America, where they are found in much greater variety than in the Old World, though *Crossopus* is not represented. Of the American forms *S. bendiri*, Merriam, is by far the largest known species of the genus. In it, as in many others inhabiting North America, the canine shows a tendency to diminish in size, which is more pronounced in *S. richardsonii*, Bachm., and in *S. vagrans*, Cooper; in *S. hoyi*, Baird, it is rudimentary, and in *S. crawfordi*, Baird, altogether absent. The diminutive *S. personatus*, Geoff., widely distributed throughout temperate North America, resembles *S. pygmæus* in its small size. Other red-toothed shrews belonging to the allied genus *Blarina*, distinguished from *Sorex* by their dentition and by the remarkable shortness of the tail, are very common on and characteristic of the North American continent.

SHREWSBURY, an old market town, a municipal and parliamentary borough, and the county and assize town of Shropshire, England, is situated on a slightly elevated peninsula formed by a bend of the Severn, and on various railway lines, 30 miles south of Chester, and 163 northwest of London by the London and North-Western railway, the distance by the Great Western being 171 miles. The Severn is crossed by three stone bridges—the English bridge (reërected 1774), on the east, consisting of seven semicircular arches; the Welsh bridge (reërected 1795), of five arches, on the west; and the Kingsland bridge (opened in 1882), of iron on the bow and girder principle. The streets are hilly and irregular, but strikingly picturesque from their number of antique timber houses, among which may be mentioned that in Butcher Row, formerly the town residence of the abbot of Lilleshall, and the old council-house overlooking the Severn, erected in 1502 for the presidents of the council of the Welsh marches. Among the principal secular buildings of the town are the fine market-house in the Elizabethan style (completed according to an inscription over the northern arch in 1595), the shire hall (rebuilt in 1837, and again, after a fire, in 1883), the music hall buildings (1840), the general market and corn exchange (1869), the workingmen's hall (1863), the drapers' hall (an old timbered structure dating from the sixteenth century), the theater (1834), and the postoffice (1877). The principal benevolent institutions are the county infirmary (1747), Millington's hospital (1734), and the eye, ear and throat hospital (1881). A monument to Lord Clive was erected in the market-place in 1860, and a Doric memorial pillar to General Lord Hill in 1816 at the top of the Abbey Foregate. The town race-course occupies a portion of the "Soldiers' Piece," where Charles I. addressed his army in 1642. To the southwest of the town is a fine park, twenty-three acres in extent, known as the Quarry, adorned by a beautiful avenue of lime trees. Formerly Shrewsbury was one of the principal marts for Welsh flannel, but this trade has now in great part ceased. Glass-staining, the spinning of flax and linen yarn, iron-founding, brewing, malting, the preparation of brawn, and the manufacture of the well-known Shrewsbury cakes are now the principal industries. The population of the municipal and parliamentary borough (area, 3,674 acres) in 1871 was 23,406, and in 1881 it was 26,478.

SHREWSBURY, EARLS OF. See TALBOT.

SHRIKE, a bird's name so given by Turner (1544), but solely on the authority of Sir Francis Lovell, for Turner had seen the bird but twice in England, though in Germany often, and could not find any one else who so called it. The species designated Shrike by Turner is the *Lanius excubitor* of Linnæus and nearly all succeeding authors, nowadays commonly known as the Greater Butcher-bird, Ash-colored or Great Gray Shrike—a bird which visits the British Islands pretty regularly, though not numerously, in autumn or winter, occasionally prolonging its stay into the next summer; but it has never been ascertained to breed there, though often asserted to have done so. This is the more remarkable since it breeds more or less commonly on the Continent from the north of France to within the Arctic Circle. Exceeding a Song-Thrush in linear measurements, it is a much less bulky bird, of a pearly gray above with a well-defined black band passing from the forehead to the ear-coverts; beneath it is nearly white, or—and this is particularly observable in Eastern examples—barred with dusky. The quill-feathers of the wings, and of the elongated tail, are variegated with black and white, but are mostly of the former, though what there is of the latter shows very conspicuously, especially at the base of the remiges, where it forms either a single or a double patch. Much smaller than this is the Red-backed Shrike, *L. collurio*, the best-known species in Great Britain, where it is a summer visitor, and, though its distribution is rather local, it may be seen in many parts of England and occasionally reaches Scotland. The cock is a sightly bird with his gray head and neck, black cheek-band, chestnut back, and pale red breast, while the hen is ordinarily of a dull brown, barred on the lower plumage. A more highly colored species is called the Woodchat, *L. auriculatus* or *rutilus*, with a bright bay crown and nape, and the rest of its plumage black, gray, and white. This is an accidental visitor to England, but breeds commonly throughout Europe. All these birds, with many others included in the genus *Lanius*, which there is no room here to specify, have, according to their respective power, the very remarkable habit (whence they have earned their opprobrious name) of catching insects, frogs, lizards, or small birds and mammals, and of spitting them on a thorn, or of fixing them in a forked branch, the more conveniently to tear them in pieces and eat them.

SHRIMP, the name applied to two species of Crustaceans commonly used as food in Great Britain. One kind after boiling is brown in color, the other bright red. The brown kind belongs to the species *Crangon vulgaris*, the red to the species *Pandalus annulicornis*. Both these species belong to the sub-order *Decapoda*, and to that division of it which is distinguished by a well-developed abdomen or tail, and called *Macroura*. The Crustaceans placed in this division have five pairs of limbs adapted for crawling on the sea-bottom; usually the anterior one or more pairs of these five are chelate or pincer-formed. In front of the ambulatory limbs are six pairs of limbs whose function is to assist in the conveyance of food to the mouth, three pairs of maxillipeds, two pairs of maxillæ, and a pair of mandibles. In front of these, again, are two pairs of antennæ and a pair of eyes. The latter are held by some naturalists to represent a pair of limbs, but evidence exists which is in opposition to this view. Behind the ambulatory limbs are six segments of the body, each bearing a pair of limbs adapted for swimming. The sixth pair of these abdominal limbs are larger than the rest and expanded, extending backward in the same plane as the flattened terminal segment of the body or telson, and three together form a powerful organ of locomotion by which a rapid backward movement of the whole body in the water is produced. The genus *Crangon* is the type of a family, the *Crangonidæ*, After boiling, the cuticle assumes its well-known brown color. Several other species of *Crangon* are known on the British shores, but none of them are as abundant as *C. vulgaris*, and they are not captured as food. *C. vulgaris* is common on the east coast of North America from North Carolina to Labrador; in the neighborhood of New York it is used as food. The species also occurs on the west coast of America from San Diego to Alaska, and is commonly eaten at San Francisco, as also is another species, *Crangon franciscorum*, Stimpson.

The genus *Pandalus*, first defined by Leach in his *Malacolgia Britannica*, is chiefly distinguished by the great length of the second pair of antennæ, which are longer than the whole body, the presence of a long spiny rostrum curved upward, the total absence of pincers on the first pair of ambulatory limbs, and the great length of the second of these limbs on the left side. It is taken usually for the market on the east and south coasts of Britain, but is widely distributed, occurring in Scotland, Ireland, Shetland, and Iceland. In color it is, when alive, of a reddish gray with spots of deeper red; when boiled it is of a uniform deep red. This species is sometimes confounded with the common prawn; but it never reaches the size of the prawn, its adult length being two to two and one-half inches.

SHROPSHIRE, or SALOP, an inland county of England, on the borders of Wales, lies between 52° 20′ and 53° 4′ N. latitude and 2° 17′ and 3° 14′ W. longitude, and is bounded north by Cheshire and an interpolated portion of Flint, east by Stafford, southeast by Worcester, south by Hereford, southwest by Radnor, west by Montgomery, and northwest by Denbigh. The total area in 1880 was 844,565 acres, or about 1,319 square miles.

Toward the west Shropshire partakes of the hilly scenery of the neighboring Wales, from which several ranges are continued into it. South of the Severn on the borders of Montgomery the Breidden Hills of Lower Silurian formation rise abruptly in three peaks, of which Cefn-y-Castell, about 1,300 feet high, is in Shropshire; and in the southwest there is a broad range of rough rounded hills known as Clun Forest, extending from Radnor. South and west of the Severn there are four other principal chains of hills extending from southwest to northeast—the Long Mynd (1,674 feet), to the west of Church Stretton, of Cambrian formation; the Caradoc Hills, a little to the north, which cross the Severn, terminating in the isolated sugar-loaf peak of the Wrekin (1,320 feet); the Wenlock Edge, to the east of Church Stretton, a sharp ridge extending for 20 miles, and in some places rising above 1,000 feet; and the Clee Hills near the southeastern border (Brown Clee Hill, 1,805 feet; Titterstone Clee Hill, 1,750 feet). The remainder of the county is for the most part pleasantly undulating, finely cultivated, and watered by numerous rivulets and streams. It may be said to lie in the basin of the Severn, which enters the county near its center from Montgomery, and flows eastward to Shrewsbury, after which it turns southeastward to Ironbridge, and then continues in a more southerly direction past Bridgnorth, entering Worcester near Bewdley. It is navigable to Shrewsbury and has connection with the Donington, the Shropshire Union, the Shrewsbury, the Birmingham and Liverpool, and the Chester and Ellesmere canals. The Dee touches the northwestern boundary of the county with Denbigh. In the south the Teme, which receives the Clun, the Onny, and the Corve, flows near the borders of Hereford, which it occasionally touches and intersects. Of the numerous lakes and pools the largest is Ellesmere (116 acres) near the borders of Denbigh.

There are five separate coal-fields within the county—the Forest of Wyre, Coalbrookdale, Shrewsbury, Clee Hills, and Oswestry. Mingled with the coal strata are several valuable courses of ironstone. The original quantity of coal in the field is estimated to have been about 43,000,000 tons, of which there are about 12,000,000 now remaining. In 1884 850,000 tons of coal, valued at $1,430,000, were raised in Shropshire from fifty-five collieries, while 198,700 tons of iron were obtained, valued at $546,425. Iron-casting forms one of the most important industries of the county. Lead mining is carried on with some success in the Stiperstones, 3,788 tons of lead ore being raised in 1884. The other principal minerals are iron pyrites (500 tons in 1884, valued at $1,250); barytes (4,939 tons, worth $36,975), and fire-clay (56,000 tons, worth $42,370).

With the exception of iron, the manufactures of the county are comparatively unimportant. Bricks and tiles, earthen and chinaware, and tobacco pipes are largely made in various districts. At Shrewsbury there are linen, yarn, and thread mills, and in several districts small paper-mills.

There is much fertile land suitable for all kinds of culture, the richest soil being that in the vicinity of the Severn, including the Vale of Shrewsbury. Out of a total area of 844,565 acres there were 716,599 in 1885 under culture, of which 150,085 were under corn crops, 61,101 under green crops, 426,859 under permanent pasture, 71,470 under rotation grasses, and 6,978 fallow. The area under woods in 1881 was 45,641 acres, and in 1885 the area under orchards was 4,015. Of grain crops the areas under wheat and barley were in 1885 nearly equal, 53,161 and 53,300 acres respectively, while that under oats amounted to 34,445, rye to 848, beans 4,648, and peas 3,683. Nearly five-sixths of the area under green crops was occupied by turnips and swedes, which covered 47,119 acres, the area under potatoes being 6,874, and that under mangold wurzel 4,355.

For parliamentary purposes the county, which was formerly shared between North and South Shropshire, was in 1885 divided into four separate divisions—Mid (Wellington), North (Newport), South (Ludlow), and West (Oswestry), each returning one member. At the same time the boroughs of Bridgenorth, Wenlock, and Ludlow were merged in the county divisions to which they severally belong; but Shrewsbury continues to return one member. The county has one court of quarter sessions, and is divided into nineteen special sessional divisions. All the boroughs have separate courts of quarter sessions and commissions of the peace. The county contains 252 civil parishes with parts of six others. Ecclesiastically it is in the dioceses of Hereford, Lichfield, and St. Asaph. The population (240,959 in 1861) in 1881 was 248,014 (124,157 males and 123,857 females). The number of persons to an acre was 0.29 and of acres to a person 3.41.

SHROVE TUESDAY, the day preceding Ash Wednesday, or the first day of Lent, was so called as the day on which "shrift" or confession was made. Compare CARNIVAL.

SHUMLA (Bulg. *Shumen*, Turk. *Shumna*), a fortified town of Bulgaria, fifty-eight miles south-southwest of Silistria and in that pashalic and fifty west of Varna. The population of Shumla in 1881 was 23,093, exclusive of the garrison. The town is renowned for its manufacture of red and yellow slippers, ready-made clothes, richly embroidered dresses for females, and its copper and tin wares. It also rears silk-worms, spins silk, and carries on an important trade in grain and wine. The branch railway from Shumla to Kaspidjan, nine and a half miles, to connect the town with the Rustchuk-Varna railway, was commenced in 1870.

SHUSHA, a town, formerly a fortress, of Russia, in the Caucasian government of Elizabethpol, lies in 39° 46′ N. latitude and 46° 25′ E. longitude, 230 miles southeast of Tiflis, on an isolated rocky eminence 3,860 feet high. In 1873 the population was 24,552 (males 13,666, females 10,886), of whom 13,504 were Armenians and 10,804 Tartars. Shusha was formerly the capital of the khanate of Karabagh. The town is locally renowned for its carpet manufactures, and the district for its excellent breed of Karabagh horses.

The present district of Shusha (2,934 square miles) forms only a part of the former khanate of Karabagh. In 1873 it had (exclusive of Shusha) a population of 80,913 (males 45,163, females 35,750), Armenians numbering 43,562 and Tartars 37,351. Agriculture and cattle-breeding are almost the sole occupations of the inhabitants. General culture is very low; there is no enterprise, and but inadequate security for life and property.

SHUSTAR, or SHÚSTAR, SHÚSHTAR (Arab, *Tostar*), once a flourishing provincial capital of Persia, is now a comparatively unimportant town of 6,000 inhabitants. It is situated (32° 3′ 30″ N. latitude and 48° 52′ E. longitude) at the foot of an offshoot of the Bakhtiári mountains in the northwest of Khuzistán, and just below the point in the Kárún (Dojail or Little Tigris) where—the main stream running westward—a cutting of seventy feet deep has been made through the natural rock for an easterly branch. Thence the two streams, inclosing a wide alluvial tract, of which Shustar is the crown, follow independent courses until they reunite some forty miles to the south. In 1875, and again in 1878, Mr. Mackenzie visited Shustar; he speaks of the town as being in a wretchedly decayed and filthy condition. The houses are of stone, some few good, with underground rooms (*sardábs* or *zir zamin*) excavated to a depth of two stories below the ground level. In these relief is obtained from the intense summer heat. The traffic of the bazaar, which is a poor one, seems to depend chiefly on the Iliyáts or wandering tribes. The inhabitants—for the most part Arabs and Sáiyids—have a reputation for hospitality.

SHUYA, one of the chief centers of the cotton industry in middle Russia, is a district town in the government of Vladimir, sixty-eight miles northeast of the town of Vladimir. A branch railway connects it with the Novki station of the railway from Moscow to Nijni-Novgorod. The town is built on the high left bank of the navigable Teza, a tributary of the Klazma, with two suburbs on the right bank. Its first linen manufactures were established in 1755; but in 1800 its population did not exceed 1,500. Its growth began only with the development of the cotton industry in central Russia, and since then has been rapid; in 1882 it had 19,560 inhabitants, as against 10,440 in 1870. Of these about 10,000 live by the manufactures, and only a few keep to agriculture and gardening. Tanneries, especially for the preparation of sheep-skins—widely renowned throughout Russia—still maintain their importance, although this industry has migrated to a great extent to the country districts. The products of its manufactories are chiefly sent to Moscow and Nijni-Novgorod. Shuya has also two gymnasia, for boys and girls, besides a progymnasium for girls, and several secondary and primary schools.

The surrounding district is also important for its manufactures. The village of Ivanovo-Voznesensk, north of Shuya, with a population of more than 19,000 inhabitants, employed 11,329 workmen in its 39 manufactories in 1881, and showed a return of $9,699,750 ($8,500,000 for cottons and the remainder for chemicals and machinery). Teikovo and Kokhma are two other centers of manufacture—the whole production of the manufactories within the district (exclusive of Shuya and Ivanovo) being estimated at $6,150,000. These figures, of course, do not include any statistics of the petty trades carried on side by side with agriculture. Nearly every village has a specialty of its own—bricks, pottery (Menschikovo), wheels, toys, packing-boxes, looms and other weaving implements, house furniture, sieves, combs, boots, gloves, felt goods, candles, and so on. The manufacture of linen and cotton in villages, as well as the preparation and manufacture of sheep-skins and rough gloves, occupies about 40,000 peasants. The Shuya merchants carry on an active trade in these products all over Russia, and in corn, spirits, salt, and other food stuffs, which are imported to a great extent. In 1880 the imported goods reached 1,613,000 hundredweights (1,208,000 by rail), and the exports 1,318,000 hundredweights, chiefly by the Teza.

SHWE-GYENG, a district of British Burmah, in the Tenasserim division, containing an area of 5,567 square miles, and lying in the valley of the Tsit-toung (Sitoung) river. It is bounded on the north by Toung-gnú district, on the east by the Poung-loung Hills and the Salwín Hill Tracts, on the south by Amherst district, and on the west by the Pegu Yoma Hills. The aspect of the country is mountainous, especially in the north. The Tsit-toung is navigable throughout its entire length in the district by large boats and steam-launches. Gold is found in most of the affluents of the river Shwe-gyeng; copper, lead, tin, and coal also exist, but are not worked. Except in the hills, the climate is generally healthy; the average annual rainfall at Shwe-gyeng station is 144 inches.

In 1881 the population of the district was 171,144 (89,687 males and 81,457 females), of whom Hindus numbered 958, Mohammedans 855, Buddhists 158,149, and Christians 1,250. The only town with more than 5,000 inhabitants is Shwe-gyeng, the capital and headquarters of the district, which was founded during the eighteenth century, before the Burmese conquest, by Alompra. It is situated at the junction of the Shwe-gyeng with the Tsit-toung, and had a population of 7,519 in 1881. Only 187 square miles of the district were cultivated in 1883–84; the cultivated area is, however, gradually extending, and there are some 3,474 square miles capable of cultivation. The principal crop is rice, of which twenty-five different kinds are grown; other products are cotton, betel-nuts, tobacco, and sugar-cane. The only industries are potteries, salt-making, and silk-spinning. In 1883–84 the total revenue amounted to $182,358, of which the land-tax contributed $79,835.

SIÁLKOT, or SEALKOTE, a district of British India, in the Amritsar division of the lieutenant-governorship of the Punjab, with an area of 1,959 square miles. It lies between 31° 44′ and 32° 50′ N. latitude and 74° 12′ and 75° 3′ E. longitude, and is bounded on the northeast by the Jámu state of Kashmir, on the northwest by the Chénab, on the east by Gurdáspur, on the southeast by the Rávi, and on the west by Lahore and Gujránwála. The Degh, which rises in the Jámu Hills, traverses the district parallel to the Rávi, and is likewise fringed by low alluvial soil. The northeastern boundary of Siálkot is twenty miles distant from the outer line of the Himálayas; but about midway between the Rávi and the Chenáb is a high dorsal tract, extending from beyond the border and stretching far into the district. Siálkot is above the average of the Punjab in fertility; three-fourths of its area have already been brought under the plow, and a third of the remainder is reported to be capable of improvement. The upper portion of the district is very productive; but the southern portion, farther removed from the influence of the rains, shows a marked decrease of fertility. The district is also watered by numerous small torrents; and several swamps or *jhils*, scattered over the face of the country, are of considerable value as reservoirs of surplus water for purposes of irrigation. Siálkot is reputed to be healthy; it is free from excessive heat, judged by the common standard of the Punjab; and its average annual rainfall is about thirty-seven inches.

The district possesses a total length of 790 miles of road; and a branch line of the Punjab Northern State railway, from Wazirábád in the northwest corner of the district to Siálkot town (twenty-eight miles), was opened in January, 1884. In 1881 the population was 1,012,148 (males 539,661, females 472,487), of whom Mohammedans numbered 669,712, Hindus 299,311, Sikhs 40,195, and Christians 1,535. The only town of any importance is SIÁLKOT, (*q.v.*) The principal agricultural products of the district are wheat, barley, rice, maize, millets, pulses, oil-seeds, sugar-cane, cotton, and vegetables. The native manufactures comprise silk, saddlery, shawl-edging, coarse chintzes, pottery, brass vessels, country cloth, cutlery, and paper. The gross revenue of the district in 1883-84 amounted to $727,655, of which the land-tax contributed $558,575.

SIÁLKOT, the capital and administrative headquarters of the above district, is situated in 32° 31′ N. latitude and 74° 36′ E. longitude, on the northern bank of the Aik torrent. It is an extensive city with handsome and well-built streets, and contains several shrines and buildings of historical interest. In 1881 its population was 39,613.

SIAM. The kingdom of Siam embraces the greater part of the Indo-Chinese and part of the Malay peninsula. On the northwest the river Salwín separates it from Karen-nee, southward thence the river Toon-gyeen; then, from the Three Pagodas in 18° 15′ N. latitude down to the Pak-chan river in 10° N. latitude, the principal watershed separates it from Pegu and Tenasserim. Its seaboard on the Bay of Bengal extends from the Pak-chan river to Wellesley Province in 5° 30′ N. latitude; but the islands along the coast are British. On the other (east) side of the peninsula the territory extends to 4° 35′ N. latitude, or, if the vassal state of Pahang is included, to Johore in about 2° 30′ N. latitude. On the east side of the Gulf of Siam the frontier line starts from the Bay of Compong Som in 103° 20′ E. longitude, and runs north inland to Mount Pangchak, thence, after crossing Tonle-sap lake, east across the Me-kong to the crests of the range which separates the Me-kong valley from Anam. It then follows this range north, including the country northeast of Luang Prabang, to the frontiers of Tongking. Thence it runs west-southwest, separating the tributary from the independent or Burmese Shan states, and meets the Salwín in about 20° N. latitude.

The great natural and economical center of Siam is the delta of the Me-nam river, which is annually flooded between June and November, the waters attaining their greatest height in August. The Tachim, the first great branch of the Me-nam, joins its right bank above Cheinnat. The west branch of the Me-nam is formed mainly by two affluents, the Me-wang and the Me-ping, which flow down through the west Laos states, some of whose chief towns are situated on their banks. On the west frontier the rapid and broken stream of the Toon-gyeen, whose tributary valleys on the Siamese side produce valuable teak and cinnamon, flows from a mass of laterite, south of which the central range consists of granite, with syenite and quartzose rocks. On the west of the Gulf of Siam, as far south as 11° N. latitude, is a dry barren region, inclosed between two ranges which intercept the rainfall on either side, but farther south are luxuriant damp forests containing *Hopea* (wood-oil), iron-wood, etc., with occasional clearings for cultivation, and many rivers with wide mouths, but becoming mere streams higher up.

In about 10° 30′ N. latitude the Malay peninsula is narrowed by a river at either side to a width of only twenty-seven miles, and there a survey for a canal has been made.

East from the plain of the Me-nam, and separating it from the Me-kong valley, a plateau rises with very gradual ascent, clothed to a width of from thirty to fifty miles with forest. This is known as Eastern Siam. From its east side several large and partly navigable rivers flow toward the Me-kong through a sandy and for the most part arid plain, with stunted growth of resinous trees and bamboos, brushwood and grass; but on the lower courses of some of these streams are rich irrigated tracts, producing rice, bananas, sugar, maize, and the usual tropical vegetables. The whole region is very unhealthy, especially in the wet season. Farther north the mountains of Pechaboun and Lom are rich in magnetic iron ore, argentiferous copper, antimony, and tin. Only the first-named is worked to any extent; and, though by very primitive methods, a large quantity of tools and weapons are manufactured. From the south of the plateau a range sweeps round to the southeast into Cambodia, outliers from which are the two peaks north and east from Chantaboun, the latter noted for its emeralds, topazes, and sapphires. Isolated hills, apparently volcanic, occur, as the sacred Mount Phrabat, to the northeast of Ayuthia, where there are hot springs and a famous footprint of the Buddha, and the conical hills at Pechaburi in the southwest, consisting of lavas, scoriæ, and trachytic rocks, abounding in caverns elaborately fitted as temples.

Tin is extensively distributed, especially throughout the Malay peninsula, where it is worked at Bang-ta-phang in the province of Chumphon, at Chaija and Chaliang, also on the Me-klong, at Kanburi, and at Rapri. Gold is found pretty extensively in Tringanu and Pahang; there are mines at Bang-ta-phang; and it is extracted in the Me-kong valley by washing or with mercury. Most of it is consumed in trinkets and presents given by the king—gold leaf being imported from China for gilding pagodas, etc. Iron abounds in the east, as at Lom and Mulu Prey, antimony at Rapri, lead at Pakphrek and Suphan, silver in the Me-pik valley. Both the lead and copper ores are often argentiferous.

As to general features, the fauna of Siam is identical with that of Burmah and of southern China, and is one of the richest in the world.

The flora is very similar in character to that of Burmah and has much in common with the Chinese, the transition to which is almost insensible.

Numerous caravans of cattle, horses, mules, and porters pass annually from Yun-nan (southwest China) to the northern (Siamese) Shan States, whence many of them proceed *via* Chieng-mai to Moulmain (Maulmain). They bring from China silk goods, tea, opium, and brass wares, and take back raw cotton, deer and rhinoceros horns, ivory, and saltpeter. The Northern States, which are a great breeding-ground for cattle and ponies—elephants, too, are exported into Burmah—send down teak and other produce. The railway from Moulmain *via* Myawaddi to Raheng, and thence to Kiangsen, 190 miles from the Chinese frontier, is certain to stimulate not only the traffic with China but the local resources, and opens up a rich and productive country hitherto entirely unknown to commerce. The Eastern States, comprising nearly half the area and a considerable part of the wealth of the kingdom, send much produce *via* Korat to Bangkok. They produce chiefly China grass (*Bœhmeria nivea*), sugar, indigo, silk, cardamoms, cotton, tobacco, sisiet (a substitute for betel), beeswax, benzoin, lac, iron, lime, sulphur, salt, coarse pottery, mats, hides, tigers, and bones, horns, and tusks of elephants, rhinoceroses, and boars. European cottons and hardware and Chinese goods penetrate everywhere, the chief entrepôts being Nangkoi in the east and Chieng-mai in the west. The eastern plains produce alternate crops of rice and salt. Much alcohol is distilled and consumed. Vast quantities (6,900 to 7,900 tons) of dried fish are prepared at Lake Tonle-sap, and at fisheries on the coast. Although silk has been known from remote antiquity, it is produced exclusively by the Lao communities settled throughout the country—the chief centers being Korat and Battampong. The export in 1884 was 325 hundredweights valued at $99,450; but the best quality hardly reaches the Bangkok market, its natural bright yellow color making it difficult to dye. Civilization increases in the eastern districts as the frontier of China is approached. In 1884 419 vessels cleared from Bangkok with cargoes valued at $135,850; of these 240 (tonnage, 151,984) were British. In addition, there were 143 junks (tonnage, 3,350). The total value of the exports was $11,131,120, rice being the principal item, $7,221,000. The imports were valued at $5,221,275, the chief items being—gray and white shirtings, $810,000; opium (704 chests), $407,050; chowls, *i.e.*, shawls, a cotton cloth from Bombay, $526,340. In 1885 the exports were valued at $9,535,300 and the imports at $6,901,016. The exports being in excess of the imports, the difference is paid in Mexican dollars, which are melted down and re-coined—the silver coinage being of the standard weight.

The land-tax is fixed at 10 per cent., the first person who clears land being entitled to hold it. There is a tax on houses, on amusements (theatricals, dancers, etc.), and on fishing-boats, nets, and other tackle. There is a royalty on tin, and the sale of opium and of alcohol is a government monopoly, farmed to Chinese. Three per cent. is levied by treaty on British and other foreign imports, export duties on a great number of raw articles, and inland or transit dues on certain tropical products. The revenue from all these sources is estimated at 80,000 catties ($4,000,000).

The head of the administration is the king, with five ministers—viz., of war, foreign affairs, northern provinces, agriculture, justice—and some thirty councilors. The country is divided into forty-one provinces, excluding the Laos and Malay states, and the Cambodian provinces. The provinces are of different grades, and their governors have cognizance of all civil cases—though there is an appeal to the capital (which generally reaches its destination, as the governor's council act as spies)—and of minor criminal cases. The graver crimes, as murder and dacoity, involving a question of life or death, committed in Siam proper, are referred to a special department in the capital. Villages are governed by a headman (*kamnan*, *amp'hon* or *nakhon*), sometimes with a small salary, chosen usually in accordance with the popular wish, and dependent on the provincial capital.

The laws of Siam are ancient, though not very full or complete, a great part having been lost at the sack of Ayuthia in 1753. Great attention is paid to precedents. The property of intestates goes to the king, of an intestate priest to his monastery; that the neglect of the heir to perform funeral rites renders his claim to property invalid is a curious relic of Hindu feeling. Another trace of this may be found in the hereditary professions, though their doctrinal significance as castes has disappeared. The laws have many curious and not inequitable provisions about slavery, *e.g.*, if a temporary (debtor) slave has undergone punishment or suffering for his master, his debt shall be remitted wholly or in part; but, if he is a slave absolutely, his master is not legally liable. And there are well-defined rules as to non-fulfillment of contract with a slave, his maintenance during famine, injury by accidents, employment as a substitute in war, etc. Slaves who are allowed to become priests or nuns are free.

All men are liable to serve in war; but only from 4,000 to 5,000, taken from classes specially at the disposal of the war department, are regularly trained under European officers. The capital and surrounding forts are garrisoned, and there is a body of palace guards. The fleet consists of some twenty men-of-war and armed steamers and 500 junks.

The population is estimated by the Siamese government at 6,000,000 for Siam proper, 3,000,000 Siamese Laos, and 1,000,000 Malays; others estimate it variously at from 6,000,000 to 8,000,000. There are besides perhaps from 1,500,000 to 2,000,000 Chinese. They are hospitable to strangers and to the poor; quarrels, violent crimes, and suicide are rare. But they are idle and apathetic; much time is devoted to amusements, as festivals and processions, boat races, games, cock and dog fighting, and even combats between fish. The position of women is good, although girls can be sold as wives. The Chinese population are energetic and industrious, but very independent, and sometimes give trouble, so that their increasing numbers and organization through their secret societies are a source of anxiety. The Siamese are of medium height, well formed, with olive complexion, darker than Chinese, but fairer and handsomer than Malays, eyes well shaped, nose slightly flattened, lips a little prominent, the face wide across the cheek bones, top of forehead pointed and chin short, thus giving the face a lozenge shape, beard scanty and with hairs pulled out, hair of head coarse and black. Slavery is general, but consists mainly of bondage for debt, a debtor being able to sell himself, wife, or children, or nephews or nieces—their freedom being recoverable on payment of the debt. But the present enlightened ruler has set his face against the practice, and decreed its abolition, except in the Laos provinces and in the eastern states. The market is further recruited, first by the sale of offenders, who have the option between death and slavery, and secondly by slave-hunting raids, made in combination with the Anamites, on the villages of the wilder aborigines. These are disposed of on the spot, or else to dealers from Cambodia or Siam proper.

BANGKOK (*q.v.*) was established as the capital in 1782 after the sack of Ayuthia by the Burmese. Its population was estimated at about 300,000 in 1886. Ayuthia, now called Krung-krao, the famous capital founded in 1351 and half destroyed by the Burmese in 1767, was a generation ago the second city of the kingdom. It is still important as the entrepôt of the trade of south Laos. Chantaburi, near the Cambodian frontier, the second port of the kingdom, is noted for its shipbuilding and fisheries, and has an active export trade from the southeastern provinces. The remaining towns of importance are Meklong, Pechaburi, where the king has a palace; Petriu, noted as the location of sugar plantations cultivated by the Chinese; Bangplassi for its extensive fisheries, Rabeng for its docks.

In the Lao or Shan country to the north Chieng-mai (Zimmé) is the most important tributary state. Its capital, Chieng-mai, the Jangomai of early European travelers, is the principal town of that region, with broad streets of good teak-built houses, surrounded with gardens, numerous pagodas, markets, and a large population. It lies in the wide fertile valley of the Meping, and is a great entrepôt of trade from Bangkok and southwest China (Yun-nan and Ssmao), which finds its natural outlet thence to the Bay of Bengal. Lapong, in the same valley, and Lagong, on a neighboring tributary, are Lao towns of less importance and subordinate to Chieng-mai, as were formerly Nan and Pre, fertile teak-producing valleys to the east. Kiang-hai and Kiang-sen, farther north, on the Me-kong, were old Lao capitals of note (see SHANS), as was Luang Prabang, with its charming capital, which, like Chieng-mai, still retains some administrative independence. One of the most important provincial centers is the district of Korat, on the eastern plateau. The country is a series of fertile oases separated by tracts of waterless forest, containing good timber, and full of game. The town is fortified, and has about thirty pagodas and some well-built houses, belonging chiefly to the Chinese merchants. Cart roads converge hither with the traffic both of north Laos and of the Cambodian provinces south and east, the latter passing up the fertile Moun valley on its way to Bangkok.

With the exception of a few schools in the capital, education is entirely in the hands of the priests, the boys going to the temples between the ages of eight or nine and thirteen. The teaching is elementary, and, by the precepts of Buddhism, must be gratuitous, the pupils repaying it by menial services in house or boat or garden, or by presents of food. At thirteen the boy enters on a novitiate, which lasts till the age of twenty-one. At twenty-one, if so disposed, he may enter the priesthood; but there are no perpetual vows. Girls are taught, if at all, only at home, by parents or brothers. Medical practice, indeed, comprises a good deal of magic; but there is also considerable knowledge of medicinal herbs, and ancient medical works were written in Pali. Inoculation was long ago introduced by the Chinese, and vaccination lately by European missionaries.

Skill is shown in the casting of large metal statues fifty feet high or more, in *repoussé* work in gold and silver, in enameling on metals, and in gold and silver tissue work. Their drawing is spirited, but strictly conventional. The system of music is elaborate, but with no written notation.

The Buddhism of Siam is the same as that of Ceylon, with slight doctrinal differences, much insisted on, from the Burmese. It is, however, professed in its purity by very few. The religious reform initiated by King Phra Mongkut, himself for many years a priest, has divided the people of the capital into two sects—the reformed, known as Dhammayut, and the older or unreformed Phra Maha Nikai. The former attach more weight to the observance of the canon than to meditation. The other sect is again divided into two parties, the one holding more to meditation, the other to the study of the scriptures. The only Brahmanical temple remaining in the country is at Bangkok, and its priests are said to be of Indian descent. There remain now at Bangkok only two communities of nuns, who are employed in the service of the temples, and are allowed to receive voluntary offerings.

The Siamese month is lunar, and, as a lunar month contains twenty-nine and one-half days, they give the odd months twenty-nine and the even thirty. This gives a year of 354 days, and to make up the deficiency they intercalate seven or eight months in nineteen years, and add beside an occasional day to the seventh month. The years are denoted by a cycle of twelve names (of animals) taken in decades, so that every sixtieth year the year of a given name returns to the same place in the decade. The system resembles the Indian cycle of sixty years, but it is derived from China, where it dates from 2637 B.C.

The name "Siam" has been usually derived from a Malay word, *sajam*, "brown;" but this is mere conjecture. They and the Shans both call themselves Thai (Shan, *Tai*) *i.e.*, "free," and the Peguans call them Shan or Shian, which seems to be a translation of "Thai" and an allied word, as are perhaps Ahom= Assam, and Sam (Assamese for Shan). The obsolete Siamese word is Siem and the Chinese Sien-lo—the Sien being, according to them, a tribe which came from the north about 1341 and united with the Loholi, who had previously occupied the shores of the gulf, and were probably Shans. A Sukkothai inscription of about 1284 states that the dominions of King Rama Kamheng extended across the country from the Me-kong to Pechaburi, and thence down the gulf of Siam to Ligor; and the Malay annals say that the Siamese had penetrated to the extremity of the peninsula before the first Malay colony from Menangkabu founded Singapore, *i.e.*, about 1160. The ancestors of the Siamese were then on the western branch of the Me-nam, and in 1351 under the famous Phaya Uthong (afterward styled Phra Rama Thibodi, and probably of a Shan family) moved down from Kamphong-pet, where they had been for five generations, to Chaliang; and being driven thence, it is said, by a pestilence, they established themselves at Ayuthia. Cambodia was invaded about this time by the Siamese, who took Angkor and held it for a time, carrying off 90,000 captives. The wars with Cambodia continued with varying success for some 400 years, but Cambodia gradually lost ground and was finally shorn of several provinces, her sovereign falling entirely under Siamese influence. This, however, latterly became displeasing to the French, now in Cochin China, and Siam has been obliged to recognize the protectorate forced on Cambodia by that power. Vigorous attacks were also made during this period on the Lao states to the northwest and northeast, followed by vast deportation of the people, and Siamese supremacy was pretty firmly established in Chieng-mai and its dependencies by the end of the eighteenth century, and over the great eastern capitals, Luang Prabang and Vien-Chang, about 1828. During the fifteenth and sixteenth centuries Siam was frequently invaded by the Burmese and Peguans, till about 1555, when the city of Ayuthia was taken and Siam reduced to dependence. From this condition, however, it was raised a few years later by the great conqueror and national hero Phra Naret, who, after subduing Laos and Cambodia, invaded Pegu, which was utterly overthrown in the next century by his successors. But after the civil wars of the eighteenth century the Burmese, having previously taken Chieng-mai which appealed to Siam for help, entered Tenasserim and took Mergui and Tavoy in 1764, and then advancing simultaneously from the north and the west captured and destroyed Ayuthia after a two years' siege (1767).

The intercourse between France and Siam began about 1580 under Phra Narain, who, by the advice of his minister, the Cephalonian adventurer Constantine Phaulcon, sent an embassy to Louis XIV. When the return mission arrived, the eagerness of the ambassador for the king's conversion to Christianity, added to the intrigues of Phaulcon with the Jesuits with the supposed intention of establishing a French supremacy, led to the death of Phaulcon, the persecution of the Christians, and the cessation of all intercourse with France. Japan was, in 1636, closed to foreigners; but trade with Siam was carried on at all events down to 1745 through Dutch and Chinese and occasional English traders.

Of European nations the Portuguese first established intercourse with Siam. This was in 1511, after the conquest of Malacca by D'Albuquerque, and the intimacy lasted over a century, the tradition of their greatness having hardly yet died out. They were supplanted gradually in the seventeenth century by the Dutch, whose intercourse also lasted for a similar period. English traders were in Siam very early in the seventeenth century; there was a friendly interchange of letters between James I. and the king of Siam, who had some Englishmen in his service, and, when the ships visited "Sia" (which was "as great a city as London") or the queen of Patani, they were hospitably received and accorded privileges—the important items of export being, as now, tin, varnish, deer-skins, and "precious drugs." Later on, the East India Company's servants, jealous at the employment of Englishmen not in their service, attacked the Siamese, which led to a massacre of the English at Mergui in 1687; and the factory at Ayuthia was abandoned in 1688. A similar attack is said to have been made in 1719 by the governor of Madras. After this the trade was neglected. Penang, a dependency of Quedah, was occupied in 1786, and in the nineteenth century the stagnation of trade led to the missions of Crawford (1822), Burney (1826), and Sir J. Brooke (1850); but they were not very cordially received, and effected little. Sir J. Bowring's treaty in 1856, however, put matters on a different footing, and Europeans can now reside in Siam, buy or rent houses, and lease land. The export and import duties are also fixed, and there is a vice-consular court at Chieng-mai, with appeal to the consular court at Bangkok, held from time to time by a judge from Singapore, with which place there are extradition arrangements. Of late years the northeastern provinces have been harassed by invasions of the Lu and Ho, peoples of Chinese extraction, their incursions extending down the Me-kong as far as Nong-kai.

SIBBALD, Sir Robert, may be considered as the most eminent representative of science and medicine in Scotland toward the close of the seventeenth century. He was born near Leslie, in Fifeshire, in 1641. He died in 1712.

SIBERIA (Russ., *Sibir*, a word of unknown origin, probably Permian) in the sixteenth century indicated the chief settlement of the Tartar khan Kutchum—Isker on the Irtish. Subsequently the name was extended so as to include the whole of the gradually increasing Russian dominions in Asia; and in the first half of the nineteenth century it was applied to the immense region stretching from the Ural Mountains to the Pacific, and from the Arctic Ocean to the Chinese frontier and the Kirghiz steppes. This region, however varied in its separate parts, constituted a geographical whole having its own characteristic physical features. The division into Western and Eastern Siberia which naturally came into general use had also a geographical meaning. In 1856, after the annexation of the Amur and Usuri regions, Eastern Siberia was extended so as to include the Russian dominions on the Pacific, although these latter in reality belong climatically and physically to a quite separate region—that of the North Pacific littoral; and, as the Russian dominions extended into the Kirghiz steppes, these last were also reckoned to Siberia, although mostly belonging in their physical features to another geographical domain—the Aral-Caspian depression. Later on these steppes were transferred to the "Orenburg region," or to the "steppe region;" but, on the other hand, some districts which really belong to Western Siberia were included under this new denomination. What is now called "Siberia" has thus lost its geographical unity. There still remains, however, for the geographer a vast tract of northern Asia which might be included under this general name, as representing some special features characteristic of the region. It would be limited by the Ural mountains on the west, by the Arctic and North Pacific Oceans on the north and east respectively, and on the south by a line broadly corresponding to the fiftieth degree of latitude, running from the sources of the river Ural to the Tarbagatai range (thus separating the steppes of the Irtish basin from those of the Aral and Balkash basins), thence along the Chinese frontier as far as the southeast corner of Transbaikalia, whence it might be drawn to the Great Khingan, and along it to the upper Zeya (tributary of the Amur) and Udskoi Ostrog on the Sea of Okhotsk. This wide area would be naturally subdivided into Western Siberia (basins of the Ob and Irtish) and Eastern Siberia (the remainder of the region).

The mineral wealth of Siberia is considerable. Gold-dust is found in almost all the alpine regions fringing the great plateau, where clay slates, talc slates, and dioritic slates, intersected by quartz veins, make up the bulk of the mountains. The chief gold-mining regions in these tracts are the Altai, the upper (or Nijne-Udinsk) and the lower (or Yeniseisk) *taigas*, and the Olekma region. Gold is found on the high plateau in the basin of the upper Vitim, on the lower plateau in the Nertchinsk district, and on the upper tributaries of the Amur (especially the Oldoi) and the Zeya, in the northeast continuation of the Nertchinsk mountains. It has been discovered also in the Bureya range, and in its northeast continuation in the Amguñ region. Auriferous sands, but not very rich, have been discovered in the feeders of Lake Khangka and the Suifun river, as also on the smaller islands of the Gulf of Peter the Great. Silver and lead ores are found in the Altai and the Nertchinsk mountains, as well as copper, cinnabar, and tin. Iron-ores are known at several places on the outskirts of the alpine tracts (as about Irkutsk), as well as in the Selenghinsk region and in the Altai. The chief iron-works of the Urals are situated on the Siberian slope (see Ural). Coal occurs in many Jurassic fresh-water basins—namely, on the outskirts of the Altai, in south Yeniseisk, about Irkutsk, in the Nertchinsk district, at many places in the Maritime Province, and on the island of Saghalin. Beds of excellent graphite have been found in the Kitoi Alps (Mount Alibert) and in the Turukhansk district. Rock-salt occurs in thinner deposits at several places on the Lena and in Transbaikalia, and salt-springs are numerous—those of Ust-kut on the Lena and of Usolie near Irkutsk being the chief. A large number of lakes, especially in Transbaikalia and in Tomsk, yield salt. Lastly, from the Altai region, as well as from the Nertchinsk mountains, precious stones, such as jasper, malachite, beryl, dark quartz, and the like, are exported. The Ekaterinburg stone-polishing works in the Urals and those of Kolyvañ in the Altai are well known.

The coast-line of Siberia is very extensive both on the Arctic Ocean and on the Pacific. The former ocean is ice-bound for at least ten months out of twelve; and, though navigation along its shores has been proved by Nordenskjöld to be possible, it is exceedingly doubtful whether it can ever become a commercial route of any importance. The coast-line has few indentations, the chief being the double bay of the Ob and the Taz, separated from the Sea of Kara by an elongated peninsula (samoyede), and from the bay of the Yenisei by another. Although Siberia is nearly all included between 50° and 72° N. latitude, its climate is extremely severe, even in its southern parts. This severity arises chiefly from the orographical structure: the vast plateau of Central

Asia prevents the moderating influence of the sea from being felt. As early as November mercury freezes in the latitude of Irkutsk (51° to 52° N. latitude), while in December, January, and even February it remains frozen for weeks together in south Siberia. Frosts of —13° to —18° Fahr. are not uncommon at Krasnoyarsk, Irkutsk, and Nertchinsk; even in the warmer southern regions of western Siberia and of the Amur the average winter temperature is respectively 2.4° Fahr. and —10.2°; while at Yakutsk and Verkhoyansk the thermometer occasionally falls as low as —75° and —85° Fahr.

The great bulk of the population are Russians, whose number has increased with great rapidity during the nineteenth century. Although not exceeding 150,000 in 1709, and 500,000 a century later, they now (1890) number more than 3,000,000, and not far from 4,000,000 if the eastern slopes of the Urals are reckoned to Siberia. At the same time the entire indigenous population does not exceed 700,000 if the Kirghizes of Semipalatinsk are reckoned to Turkestan, and many indigenes are rapidly dying out. The Russians, issuing from the middle Urals, have traveled as a broad stream through south Siberia, sending lateral branches to the Altai, to the Ili river in Turkestan, and to Minusinsk, as well as down the chief rivers which flow to the Arctic Ocean, the banks of which are studded with villages fifteen to twenty miles apart. As Lake Baikal is approached the stream of Russian immigration becomes narrower, occupying only the valley of the Angara, with a series of villages up the Irkut; but it widens again in Transbaikalia, sending lateral branches up the Selenga and its tributaries. It follows the course of the Amur, again in a succession of villages some twenty miles apart, and can be traced up the Usuri to Lake Khangka and Vladivostok, with an extension of villages on the plains between the Zeya and the Selimja. Small Russian settlements also occur on a few bays of the North Pacific and the Sea of Okhotsk, as well as on Saghalin. The Russians have thus occupied all the best agricultural tracts in western and eastern Siberia.

Agriculture is the chief occupation both of the settled Russian and of the native population. South Siberia has a very fertile soil and yields rich crops, but immense tracts are utterly unfit for tillage. In the lowlands of western Siberia it is carried on up to 61° N. latitude. On the high plains fringing the alpine tracts on the northwest it can be carried on only in the south, farther north only in the valleys, reaching 62° N. latitude in that of the Lena, and in the alpine tracts only in a few valleys, as that of the Irkut. On the high plateau all attempts to grow cereals have failed—only the wide trenches (Uda, Selenga, Djida) giving encouragement to the agriculturist. On the lower plateau, in Transbaikalia, grain is successfully raised in the Nertchinsk region—with serious risk, however, from early frosts in the valleys of the mountain-ridges which rise above its surface.

Cattle-breeding is extensively carried on in many parts. In the Ob and Irtish region of western Siberia there are about 2,000,000 horses, 1,500,000 head of horned cattle, 3,000,000 sheep, and 100,000 reindeer; for eastern Siberia the figures are approximately 850,000 horses, 1,100,000 horned cattle, 1,120,000 sheep, and about 50,000 reindeer. The industry is, however, carried on in the most primitive manner. In Transbaikalia little hay is made, and the Buriat horses seek their food throughout the winter beneath the thin sheet of snow which covers the steppes. A single snowstorm in spring sometimes destroys in a few days thousands of horses thus weakened. In western Siberia the "Siberian plague" makes great ravages, and the average losses are estimated at about 37,500 head of cattle annually.

Bee-keeping is widely diffused, especially in Tomsk and the Altai. Honey is exported to Russia. The seeds of the stone-pine are collected for oil in western Siberia.

Hunting still continues to be a profitable occupation, the male population of whole villages in the hilly and woody tracts setting out in October for a month's hunting. The sable, however, which formerly constituted the wealth of Siberia, is now so scarce that four sables per man is the maximum in the best districts. Squirrels, bears, foxes, snow-foxes, antelopes, and especially deer in spring are at present the principal objects of the chase.

The same falling off is observable in the fisheries—one species at least, the *Rhytina stelleri*, having completely disappeared within the nineteenth century. Fishing is still a valuable source of income on the lower courses of the great rivers, especially the Ob, where the yearly earnings amount to about $150,000. The fisheries on Lake Baikal supply cheap food (the *omul*) to the poorer classes of Irkutsk and Transbaikalia. The native populations of the Amur—Golds and Ghilyaks—support themselves chiefly by their fisheries, when the salmon enters in dense masses the Amur and its tributaries.

Though Siberia has within itself all the raw produce necessary for prosperous industries, it continues to import from Russia, without exception, all the manufactured articles it uses. Owing to the distances over which they are carried and the bad organization of trade, all manufactured articles are exceedingly dear, especially in the east. The manufactories of Siberia employ less than 15,000 workmen, and their aggregate production does not exceed $8,000,000 in value; of these 11,500 are employed in western Siberia, the yearly production being about $6,000,000. Nearly one-third of the total represents wine-spirit, 23 per cent. tanneries, 18 per cent. tallow-melting, and a considerable sum cigarette-making. The villages of Siberia do not carry on a variety of petty trades like the villages in Russia, except in the districts of Tobolsk nearest the Urals, where tanning, boot-making, carpet-making, and the like are prosecuted.

Mining is in the same backward state as manufacturing industry. The chief attention is given to gold-mining. But the use of improved machinery is far from common, and the condition of the workmen wretchedly bad—insufficient food, bad lodgings, and overwork under the most unsanitary conditions. As the geology of the gold-mining districts is quite unknown, immense sums are sunk in futile search. The amount of gold obtained has much increased since mining was begun in the Nertchinsk district and parts of the Altai (a right formerly reserved for the imperial government), and since the discovery of auriferous deposits in the basin of the Amur and in the Maritime province.

Trade is in the hands of a few merchants. The chief market is the Nijni-Novgorod fair, where Siberian merchants get twelve or eighteen months' credit at correspondingly high rates. Prices on the Amur are not more favorable, since the trade by sea is prevented from developing owing to the facility with which great profits are made by the exchange of wine-spirit and sables for whisky. The villages are in a still worse condition, whole populations being dependent for the necessaries of life upon a few merchants. The foreign trade is insignificant.

Siberia is a great penal colony. Exile to Siberia began in the first years of its discovery, and as early as 1658 we find the Non-conformist priest Avvakum following in chains the exploring party of Pashkoff on the Amur. Raskolniks in the second half of the seventeenth century, rebel *stryeltsy* under Peter I., courtiers of rank during the reigns of the empresses, Polish confederates under Catherine II., the "Decembrists" under Nicholas I., nearly 50,000 Poles after the insurrection of 1863, and later on whole generations of socialists were sent to Siberia; while the number of common-law convicts and exiles transported thither has steadily increased since the end of the eighteenth century. No exact statistics of Siberian exile were kept before 1823. But it is known that in the first years of the nineteenth century nearly 2,000 persons were transported every year to Siberia. This figure had reached an average of 18,250 in 1873–77 and rose above 20,000 in 1882. Since that time the number has fluctuated but has never reached that point.

Siberia is divided into four governments—Tobolsk, Tomsk, Yeniseisk, and Irkutsk—and four provinces—Yakutsk, Transbaikalia, Amur, and Maritime or Primorskaya. The first two are under governors, like Russian governments; the next four are under the governor-general of Eastern Siberia, who resides at Irkutsk; the Amur and Maritime provinces are under the governor-general of the Amur, who resides at Khabarovka, at the junction of the Amur and the Usuri. The respective chief towns are—Tobolsk, Tomsk, Krasnoyarsk, Irkutsk, Yakutsk, Tchita, Blagoveschensk, and Khabarovka. The provinces of Akmolinsk (chief town, Akmoly) and Semiryetchensk (chief town, Vyernyi) are now parts of the steppe governor-generalship. Each government and province is subdivided into districts; the administrative head is a civil governor in the governments and a military governor in the provinces.

SIBSÁGAR, or SEEBSAUGOR, a British district of India, in the upper valley of the province of Assam, lying between 26° 19′ and 27° 16′ N. latitude and 93° 21′ and 95° 25′ E. longitude, and covering an area of 2,855 square miles. It is bounded on the north and east by Lakhimpur district, on the south by independent Nágá territory, and on the west by the Nowgong and Nágá Hills districts. In 1881 the population of Sibságar was 370,274.

The staple product is rice, which yields two crops in the year; tea is also extensively grown, Sibságar being second only to Cachar among the tea-growing districts of India; other crops include food-grains, pulses, oilseeds, sugar-cane, and cinchona. The local industries are limited to the weaving of silk and cotton cloth, the making of brass and bell-metal utensils, and coarse pottery. The principal exports are tea, silk, mustard-seed, cotton, and jungle products; the imports include salt, oil, opium, piece-goods, and miscellaneous hardware.

SIBSÁGAR, chief town and civil headquarters of the above district, is situated about eleven miles south from the Brahmaputra, being picturesquely placed around a magnificent tank covering an area of 114 acres. In 1881 the population of the town was 5,868.

SIBYL. Certain women who prophesied under the inspiration of a deity were called by the Greeks Sibyls. The inspiration manifested itself outwardly in distorted features, foaming mouth, and frantic gestures. The notion that hysterical, convulsive, and epileptic affections are proof of divine inspiration has been common all over the world. The Sibyl of whom we hear most was the Sibyl of Cumæ, whom Æneas consulted before his descent to Hades. She was supposed to live a thousand years. It was she who sold to Tarquin the Proud the Sibylline books. She first offered him nine; when he refused them, she burned three and offered him the remaining six at the same price; when he again refused them, she burned three more and offered him the remaining three still at the same price. Tarquin then bought them. They were intrusted to a college of fifteen men (*quindecemviri sacris faciundis*), who preserved them and consulted them on occasions of national danger. It would seem that they were consulted with a view to discover, not exact predictions of definite future events, but the religious observances necessary to avert extraordinary calamities and expiate prodigies. They were written in hexameter verse and in Greek; hence the college of curators was always assisted by two Greek interpreters. The books were kept in the temple of Jupiter on the Capitol and shared the destruction of the temple by fire in 83 B.C. After the restoration of the temple the senate sent ambassadors in 76 to Erythræ to collect the oracles afresh and they brought back about 1,000 verses; others were collected in Ilium, Samos, Sicily, Italy, and Africa. In the year 12 Augustus sought out and burned a great many spurious oracles and subjected the Sibylline books to a critical revision; they were then placed by him in the temple of Apollo Patrous, where we hear of them still existing in 363. They seem to have been burned by Stilicho shortly after 400.

SICILY, slightly surpassed by Sardinia in superficial extent, is in its geographical and historical position, the greatest island of the Mediterranean. The geographical position of Sicily led almost as a matter of necessity to its historical position, as the meeting-place of the nations, the battle field of contending races and creeds. Lying nearer to the mainland of Europe and nearer to Africa than any other of the great Mediterranean islands, Sicily is, next to Spain, the connecting link between these two quarters of the world. It stands also as a breakwater between the eastern and western divisions of the Mediterranean Sea.

The Phœnician, whether from old Phœnicia or from Carthage, came from lands which were mere strips of sea-coast with a boundless continent behind them. The Greek of old Hellas came from a land of islands, peninsulas, and inland seas. So did the Greek of Asia, though he had, like the Phœnician, a vast continent behind him. In Sicily they all found a strip of sea-coast with an inland region behind, but the strip of sea-coast was not like the broken coast of Greece and Greek Asia, and the inland region was not a boundless continent like Africa or Asia. In Sicily therefore the Greek became more continental, and the Phœnician became more insular, than either nation had been in its own land. Neither people ever occupied the whole island: the presence of the other hindered either from occupying even the whole of the coast; nor was either people ever able to spread its dominion over the earlier inhabitants very far inland. Sicily thus remained a world of its own, with interests and disputes of its own, and divided among inhabitants of various nations. The history of the Greeks of Sicily is constantly connected with the history of old Hellas, but it runs a separate course of its own.

The first period of Sicilian history lasts as long as Sicily remains untouched from any non-Hellenic quarter outside, and as long as the Greek cities in Sicily remain as a rule independent of one another. A change begins in the sixth century and is accomplished early in the fifth. The Phœnician settlements in Sicily become dependent on Carthage, whose growing power begins to be dangerous to the Greeks of Sicily. Meanwhile the growth of tyrannies in the Greek cities was beginning to group several towns together under a single master, and thus to increase the greatness of particular cities at the expense of their freedom.

During the time of prosperity there was no dread of Carthaginian inroads. But in 454 B.C. we read of a war between Segesta and Lilybaion (Lilybæum). There was as yet no town of Lilybaion; but, if the war was waged against any Phœnician settlement, the fact is to be noticed, as hitherto Segesta has been allied with the Phœnicians against the Greeks. Far more important are our notices of the earlier inhabitants; for now comes the great Sikel movement under Douketios, who, between force and persuasion, came nearer toward uniting his people into one body than had ever been done before.

Up to this time the Italiot and Sikeliot Greeks have formed part of the general Greek world, while within that world they have formed a world of their own, and Sicily has again formed a world of its own within that. Wars and conquests between Greeks and Greeks, especially on the part of Syracuse, though not wanting, have been on the whole less constant than in old Greece. It is even possible to appeal to a vein of local Sicilian patriotism, to preach a kind of Monroe doctrine by which Greeks from other lands should be shut out as strangers (ἀλλόφυλοι). Presently this state of Sicilian isolation was broken in upon by the great Peloponnesian war. The Sikeliot cities were drawn into alliance with one side or the other, till the main interest of Greek history gathers for a while round the Athenian attack on Syracuse. At the very beginning of the war the Lacedæmonians looked for help from the Dorian Sikeliots. But the first active intervention came from the other side. Conquest in Sicily was a favorite dream at Athens (Thuc., vi. 1, cf. i. 48, and Diod., xii. 54), with a view to wider conquest or influence in the western Mediterranean. An opportunity for Athenian interference was found in 427 in a quarrel between Syracuse and Leontinoi and their allies.

The far more memorable interference of Athens in Sicilian affairs in the year 415 was partly in answer to the cry of the exiles of Leontinoi, partly to a quite distinct appeal from the Elymian Segesta. That city, an ally of Athens, asked for Athenian help against its Greek neighbor Selinous. In a dispute, partly about boundaries, partly about the right of intermarriage between the Hellenic and the Hellenizing city, Segesta was hard pressed. She vainly asked for help at Akragas—some say at Syracuse (Diod., xii. 82)—and even at Carthage. The last appeal was to Athens. But the claims of Segesta and Leontinoi are soon forgotten in the struggle for life and death between Syracuse and Athens.

The details of the great Athenian expedition (415–413) belong partly to the political history of Athens, partly to that of SYRACUSE, (*q.v.*) But its results make it a marked epoch in Sicilian history, and the Athenian plans, if successful, would have changed the whole face of the West.

But before the war in old Greece was over, seventy years after the great victory of Gelon (410), the Greeks of Sicily had to undergo barbarian invasion on a vaster scale than ever. The disputes between Segesta and Selinous called in these enemies also. Carthage stepped in as the ally of Segesta, the enemy of her old ally Selinous. Her leader was Hannibal, grandson and avenger of the Hamilkar, who had died at Himera. In 408, at the head of a vast mercenary host, he sailed to Sicily, attacked Selinous, and stormed the town after a murderous assault of nine days, while the other Sikeliot cities, summoned to help, were still lingering. The walls and temples were overthrown; the mass of the people were massacred; the few who escaped were allowed to return to the dismantled site as tributaries of Carthage; and the city never recovered its old greatness. Thence Hannibal went on to Himera, with the special mission of avenging his grandfather. By this time the other Greek cities were stirred to help, while Sikels and Sikans joined Hannibal; the strife was distinctly a strife of Greeks and barbarians. At last Himera was stormed, and 3,000 of its citizens were solemnly slaughtered on the spot where Hamilkar had died. Himera ceased to exist; but the Carthaginians founded the new town of Thermai (Termini) not far off, to which the name is sometimes laxly applied. The Phœnician possessions in Sicily now stretched across the island from Himera to Selinous. The next victim was Akragas; its defenders, natives and allies, quarreled among themselves; the mass of the people forsook the city, and found shelter at Gela and elsewhere. The few who were left were slaughtered; the town was sacked and the walls destroyed. Akragas was presently restored, and it has lived on to this day; but it never recovered its old greatness.

Meanwhile the revolutions of Syracuse affected the history of Sicily and of the whole Greek world. Dionysius the tyrant began his reign of thirty-eight years in the first months of 405.

The reign of Dionysius (405–367) is divided into marked periods by four wars with Carthage, in 397–396, 392, 383, and 368. In the first war his home power was all but overthrown; but he lived through the storm, and extended his dominion over Naxos, Katana, and Leontinoi. All three perished as Greek cities. Katana was the first Sikeliot city to receive a settlement of Campanian mercenaries, while others settled in non-Hellenic Entella. Naxos was settled by Sikels. Leontinoi was again merged in Syracuse. Now began the dealings of Dionysius with Italy.

The Punic war of 392–391 was not very memorable. Both sides failed in their chief enterprises.

Dionysius, at the close of this war, free from Phœnician warfare, gave his mind to enterprises which raised his power to its greatest height. In the years 390–387 he warred against the Italiot cities in alliance with their Lucanian enemies.

In old Greece men now said that the Greek folk was hemmed in between the barbarian Artaxerxes on the one side and Dionysius, master and planter of barbarians, on the other. These feelings found expression when Dionysius sent his embassy to the Olympic games of 384, and when Lysias bade Greece rise against both its oppressors. Dionysius vented his wrath on those who were nearest to him, banishing many, among them his brother Leptines and his earliest friend Philistos, and putting many to death. He was also once more stirred up to play the part of a Hellenic champion; he made ready for yet another Punic war.

In this war (383–382) Dionysius seems for once to have had his head turned by a first success. His demand that Carthage should altogether withdraw from Sicily was met by a crushing defeat. Then came a treaty by which Carthage kept Selinous and part of the land of Akragas. The Halykos became the boundary. Dionysius had also to pay 1,000 talents, which caused him to be spoken of as becoming tributary to the barbarians. In the last years of his reign we hear dimly of both Syracusan and Carthaginian operations in southern Italy. He also gave help to Sparta against Thebes, sending Gaulish and Iberian mercenaries to take part in Greek warfare. His last war with Carthage, which was going on at his death, was ended by a peace by which the Halykos remained the boundary.

The tyranny of Dionysius fell, as usual, in the second generation; but it was kept up for ten years after his death by the energy of Philistos, now minister of his son Dionysius the Younger. It fell with the coming back of the exile Dion in 357.

The time following the Dionysian tyranny was at Syracuse a time full of the most stirring local and personal interest, under her two deliverers Dion and Timoleon. It is less easy to make out the exact effect on the rest of Sicily of the three years' career of Dion. But we may mark that, in driving out the younger Dionysius, he was helped by a general movement of Greeks, Sikels, and Sikans. Between the death of Dion in 354 and the coming of Timoleon in 344 we hear of a time of confusion in which Hellenic life seemed likely to die out. The cities, Greek and Sikel, were occupied by tyrants. Syracuse was parted between several, Dionysius coming back to hold Ortygia.

With Timoleon begins a series of leaders who came from old Greece to deliver or to conquer among the Greeks of Italy and Sicily.

The Campanian occupation of Messina is the first of the chain of events which led to the Roman dominion in Sicily. As yet Rome has hardly been mentioned in Sicilian story, either for friendship or for enmity. The Mamertine settlement, the war with Pyrrhos, bring us on quickly. The Greek king, on his way back to fight for Tarentum against Rome, had to cut his way through Carthaginians and Mamertines in Roman alliance. His saying that he left Sicily as a wrestling-ground for Romans and Carthaginians was the very truth of the matter. Very soon came the first war between Rome and Carthage, the war which is best marked by its other name of the War for Sicily. It mattered much, now that Sicily was to have a barbarian master, whether that master should be the kindred barbarian of Europe or the barbarian of Asia transplanted to the shore of Africa. That question was decided for Europe, that is for Rome, now beginning her long career as European champion. That strife, too, gave a large part of Sicily a last day of prosperity under a native ruler who was a king and not a tyrant.

We have no picture of Sicily in the first period of Roman rule. One hundred and seventy years later several towns within the original province enjoyed various degrees of freedom, which they had doubtless kept from the beginning.

With the incorporation of the kingdom of Hieron into the Roman province independent Sicilian history comes to an end for many ages. Of the state of Sicily under the Roman commonwealth our chief source of knowledge is the pleading of Cicero against the worst Roman oppressor of Sicily, Gaius Verres. Next in importance to this come those fragments of Diodoros which describe the two insurrections of the slaves. Between those insurrections came the legislation of Rupilius which settled the Roman system of administration in Sicily. Cicero's description comes later than all these; but the general relations between Rome and Sicily seem to have been much the same from the first occupation till the beginning of the empire.

In its provincial state Sicily fell back more than some other provinces. Ausonius could still reckon Catina and fourfold Syracuse ("quadruplices Syracusas") among noble cities; but Sicily is not, like Gaul, rich in relics of later Roman life, and it is now Egypt rather than Sicily that feeds Rome. The island has no internal history beyond a very characteristic fact, a third slave war in the days of Gallienus. External history there could be none in the central island, with no frontier open to Germans or Persians. Sicilian history begins again when the wandering of the nations planted new powers, not on the frontier of the empire, but at its heart.

The powers between which Sicily now passes to and fro are Teutonic powers. The earlier stages of Teutonic advance could not touch Sicily. Alaric thought of a Sicilian expedition, but a storm hindered him. Sicily was to be reached only by a Teutonic power which made its way through Gaul, Spain, and Africa. The Vandal now dwells at Carthage instead of the Canaanite. Gaiseric (429–477) subdued the great islands for which Roman and Phœnician had striven. Along with Sardinia, Corsica, and the Balearic Isles, Sicily is again a possession of a naval power at Carthage. Gaiseric, at Rome more than a Hannibal, makes a treaty with Odowakar (Odoacer) almost like that which ended the First Punic War. He gave up (Victor Vitensis, i. 4) the island on condition of a tribute, which was hardly paid by Theodoric. Sicily was now ruled by a Gothic count, and the Goths claimed to have treated the land with special tenderness (Procopius, *Bell. Goth.*, iii. 16). The island, like the rest of Theodoric's dominions, was certainly well looked after by the great king and his minister; yet we hear darkly of disaffection to Gothic rule (Cass., *Var.* i. 3). Theodoric gave back Lilybaion to the Vandal king Thrasamund as the dowry of his sister Analafrida (Proc., *Bell. Vand.*, i. 8). Yet Lilybaion was a Gothic possession when Belisarius, conqueror of Africa, demanded it in vain as part of the Vandal possessions (Proc., *Bell. Vand.*, ii. 5; *Bell. Goth.*, i. 3). In the Gothic war Sicily was the first land to be recovered for the empire, and that with the good will of its people (535). Panormus alone was stoutly defended by its Gothic garrison. In 550 Totila took some fortresses, but the great cities all withstood him, and the Goths were driven out the next year.

Sicily was thus won back to the Roman dominion, but the seat of the Roman dominion was now at Constantinople. Belisarius was Pyrrhus and Marcellus in one. For 430 years some part of Sicily, for 282 years the whole of it, again remained a Roman province. To the Gothic count again succeeded, under Justinian, a Roman *prætor*, in Greek, στρατηγός. That was the official title; we often hear of a *patrician* of Sicily, but patrician was in strictness a personal rank. In the later mapping out of the empire into purely military divisions, the *theme* (θεμα) of Sicily took in both the island and the nearest peninsula of the mainland, the oldest Italy. The island itself was divided for financial purposes, almost as in the older times, into the two divisions of Syracuse and Lilybaion. The revolutions of Italy hardly touched a land which looked steadily to the eastern Rome as its head. The Lombard and Frankish masters of the peninsula never fixed themselves in the island. When the Frank took the imperial crown of of the West, Sicily still kept its allegiance to the Augustus who reigned at Constantinople, and was only torn away piecemeal from the empire by the next race of conquerors.

In the ninth, tenth, and eleventh centuries the old drama of Sicily was acted again. The island is again disputed between Europe and Asia, transplanted to Africa, between Greek and Semitic dwellers on her own soil. Panormus and Syracuse are again the headquarters of races and creeds, of creeds yet more than of races. The older religious differences—not small certainly when the choice lay between Zeus and Moloch—were small compared with the strife for life and death between Christendom and Islam. Gregory and Mahomet were contemporaries, and, though Saracen occupation did not begin in Sicily till more than two centuries after Gregory's death, Saracen inroads began much sooner. In 655 (Theoph., i. 532) part of Sicily was plundered, and its inhabitants carried to Damascus. Then came the strange episode of the visit of Constans the Second (641–668), the first emperor, it would seem, who had set foot in Sicily since Julian. After a war with the Lombards, after twelve days' plunder of Rome, he came on to Syracuse, where his oppressions led to his murder in 668. Sicily now saw for the first time the setting up of a tyrant in the later sense. Meketios, commander of the eastern army of Constans, revolted, but Sicily and Roman Italy kept their allegiance to the new emperor Constantine Pogonatos, who came in person to destroy him. Then came another Saracen inroad from Alexandria, in which Syracuse was sacked (Paul. Diac., v. 13). Others followed, but there was as yet no lasting settlement. Toward the end of the eighth century, though Sicily itself was untouched, its patricians and their forces play a part in the affairs of southern Italy as enemies of the Frankish power. Charles himself was believed (Theoph., i. 736) to have designs on Sicily; but, when it came to Saracen invasion, the sympathies of both pope and Cæsar lay with the invaded Christian land (*Mon. Car.*, 323, 328.)

In 813 a peace for ten years was made between the Saracens and the patrician Gregory. A few years after it expired Saracen settlement in the island began.

A far greater conquest followed when new invaders came from Spain and when Theodotos was killed in 830. The next year Panormus passed away forever from Roman, for 230 years from Christian, rule. Syracuse was for fifty years not only, as of old, the bulwark of Europe, but the bulwark of Christendom. By the conquest of Panormus the Saracens were firmly rooted in the island.

The chief work of the next ten years was the conquest of the Val di Noto, but the first great advance was made elsewhere. In 843 the Saracens won the Mamertine city, Messina, and thus stood in the path between Italy and Sicily. Then the work of conquest, as described by the Arabic writers, went on, but slowly.

In fifty-one years the imperial and Christian territory in Sicily was cut down to a few points on or near the the eastern coast, to the Val Demone in short without Messina. But between Moslem dissension and Christian valor the struggle had still to be waged for eighty-seven years. Henna had been the chief center of Christian resistance a generation earlier; its place was now taken by the small fort of Rametta not far from Messina. The Moslems of Sicily were busy in civil wars; Arabs fought against Berbers, both against the African overlord.

The emperors never gave up their claims to Sicily or their hopes of recovering it. Besides the struggle with the Christians in the island, there was often direct warfare between the empire and the Saracens; but such warfare was more active in Italy than in Sicily. In 956 a peace or truce was made by the emperor Constantine Porphyrogenitus. A few years later Otho the Great, the restorer of the Western empire, looked to Sicily as a land to be won back for Christendom. It had not yet wholly passed away; but the day soon came. Strange to say, as Syracuse fell in the reign of Basil the Macedonian, the Saracen occupation was completed in the reign of Nikephoros Phokas (Nicephorus Phocas), the deliverer of Crete. In the very year of his accession (963) Tauromenium was taken for the second time, and became for a hundred years a Mohammedan possession. Rametta alone held out. A fleet and army from Constantinople went in vain to its help; the last stronghold of Christendom was taken (965), and for a season all was over.

Thus in 138 years the Arab did what the Canaanite had never done. The whole island was a Semitic, that is now a Mohammedan, possession. The Greek-speaking Roman of Sicily was a bondman in his own land, like the Latin-speaking Roman of Spain. Yet the complete Saracen possession of Sicily may seem a thing of a moment. Its first and longest period lasted only seventy-three years. The second Saracen occupation of all Sicily was short indeed. In 1060 began the thirty years' work of the first Roger.

Thus for 263 years the Christian people of some part or other of Sicily were in subjection to Moslem masters.

The most brilliant time for Sicily as a power in the world begins with the coming of the Normans. Never before or after was the island so united or so independent. Some of the old tyrants had ruled out of Sicily; none had ruled over all Sicily. The Normans held all Sicily as the center of a dominion which stretched far beyond it. The conquest was the work of one man, Count Roger of the house of Hauteville, brother of the more famous Robert Wiscard (Guiscard). That it took him thirty years was doubtless owing to his being often called off to help his brother in Italy and beyond Hadria. The conquests of the Normans in Italy and Sicily form part of one enterprise; but they altogether differ in character. In Italy they overthrew the Byzantine dominion; their own rule was perhaps not worse, but they were not deliverers. In Sicily they were everywhere welcomed by the Christians as deliverers from infidel bondage.

Four generations only span the time from the birth of Count Roger, about 1030, to the death of the emperor Frederick the Second in 1250. Roger, great count of Sicily, was, at his death in 1101, succeeded by his young son Simon, and he in 1105 by the second Roger, the first king. He inherited all Sicily, save half of Palermo—the other half had been given up—and part of Calabria. The rest of Palermo was soon granted; the Semitic capital became the abiding head of Sicily. On the death of Duke William of Apulia, Roger gradually founded (1127–40) a great Italian dominion. To the Apulian duchy he added (1136) the Norman principality of Capua, Naples (1138), the last dependency of the eastern empire in Italy, and (1140) the Abruzzi, an undoubted land of the western empire. He thus formed a dominion which has been divided, united, and handed over from one prince to another, oftener than any other state in Europe, but whose frontier has hardly changed at all. In 1130 Roger was crowned at Palermo, by authority of the antipope Anacletus, taking the strange title of "king of Sicily and Italy."

Roger's son William, surnamed the Bad, was crowned in his father's lifetime in 1151. Roger died in 1154, and William's sole reign lasted till 1166. It was a time of domestic rebellions, chiefly against the king's unpopular ministers, and it is further marked by the loss of Roger's African conquests. After William the Bad came (1166–1189) his son, William the Good.

The brightest days of Sicily ended with William the Good. His marriage with Joanna, daughter of Henry of Anjou and England, was childless, and William tried to procure the succession of his aunt Constance and her husband, King Henry the Sixth of Germany, son of the emperor Frederick the First. But the prospect of German rule was unpopular, and on William's death the crown passed to Tancred, an illegitimate grandson of King Roger, who figures in English histories in the story of Richard's crusade. In 1191 Henry, now emperor, asserted his claims; but, while Tancred lived, he did little, in Sicily nothing, to enforce them. On the death of Tancred (1194) and the accession of his young son William the Third, the emperor came and conquered Sicily and the Italian possessions, with an amount of cruelty which outdid any earlier war or revolution. First of four western emperors who wore the Sicilian crown, Henry died in 1197, leaving the kingdom to his young son Frederick, heir of the Norman kings through his mother.

The Germans who helped Henry to win the Sicilis crown did not become a new element in the island, but only a source of confusion during the minority of his son. Frederick—presently to be the renowned emperor Frederick the Second, "Fridericus stupor mundi et immutator mirabilis"—was crowned at Palermo in 1198.

Under Frederick the Italian or Lombard element finally prevailed in Sicily. Of all his kingdoms Sicily was the best-beloved. He spoke all its tongues; he protected, as far as circumstances would allow, all its races. He legislated for all in the spirit of an enlightened and equal despotism, jealous of all special privileges, whether of nobles, churches or cities.

Two emperors had now held the Sicilian crown. On Frederick's death in 1250 the crown passed to his son Conrad, not emperor indeed, but king of the Romans. He was nominally succeeded by his son Conradin. The real ruler under both was Frederick's natural son Manfred. In 1258, on a false rumor of the death of Conradin, Manfred was himself crowned king at Palermo. He had to found the kingdom afresh. But papal enmity was too much for him. His overlord claimed to dispose of his crown, and hawked it about among the princes of the West. Edmund of England bore the Sicilian title for a moment. More came of the grant of Urban the Fourth (1264) to Charles, count of Anjou, and through his wife sovereign count of Provence. Charles, crowned by the pope in 1266, marched to take possession of his lord's grant. Manfred was defeated and slain at Benevento. The whole Sicilian kingdom became the spoil of a stranger who was no deliverer to any class of its people. The island sank yet lower. In the continental lands Charles founded a dynasty; the island he lost after sixteen years. His rule was not merely the rule of a stranger king surrounded by stranger followers; the degradation of the island was aggravated by gross oppression, grosser than in the continental lands. The continental lands submitted, with a few slight efforts at resistance. The final result of the Angevin conquest of Sicily was its separation from the mainland.

Sicilian feeling was first shown in the support given to the luckless expedition of Conradin in 1268. Frightful executions in the island followed his fall. The rights of the Swabian house were now held to pass to Peter (Pedro), king of Aragon, husband of Manfred's daughter Constance. The connection with Spain, which has so deeply affected the whole later history of Sicily, now begins. Charles held the Greek possessions of Manfred and had designs both on Epeiros and on Constantinople. The emperor Michael Palaiologos and Peter of Aragon became allies against Charles; the famous John of Procida acted as an agent between them; the costs of Charles' eastern warfare caused great discontent, especially in an island where some might still look to the Greek emperor as a natural deliverer. Peter and Michael were doubtless watching the turn of things in Sicily; but the tale of a long-hidden conspiracy between them and the whole Sicilian people has been set aside by Amari. The actual outbreak of 1282, the famous Sicilian Vespers, was stirred up by the wrongs of the moment. A gross case of insult offered by a Frenchman to a Sicilian woman led to the massacre at Palermo, and the like scenes followed elsewhere. The strangers were cut off; Sicily was left to its own people. The towns and districts left without a ruler by no means designed to throw off the authority of the overlord; they sought the good will of Pope Martin. But papal interests were on the side of Charles; and he went forth with the blessing of the church to win back his lost kingdom.

Charles was now besieging Messina; Sicily seems to have put on some approach to the form of a federal commonwealth. Meanwhile Peter of Aragon was watching and preparing. He now declared himself. To all, except the citizens of the great cities, a king would be acceptable; Peter was chosen with little opposition in a parliament at Palermo, and a struggle of twenty-one years began, of which Charles and Peter saw only the first stage. In fact, after Peter had helped the Sicilians to relieve Messina, he was very little in Sicily; he had to defend his kingdom of Aragon, which Pope Martin had granted to another French Charles. He was represented by Queen Constance, and his great admiral Roger de Loria kept the war away from Sicily, waging it wholly in Italy, and making Charles, the son of King Charles, prisoner. In 1285 both the rival kings died. Charles had before his death been driven to make large legislative concessions to his subjects to stop the tendency shown, especially in Naples, to join the revolted Sicilians. By Peter's death Aragon and Sicily were separated; his eldest son Alphonso took Aragon, and his second son James took Sicily, which was to pass to the third son Frederick, if James died childless. James was crowned, and held his reforming parliament also. With the popes no terms could be made. Charles, released in 1288 under a deceptive negotiation, was crowned king of Sicily by Honorius; but he had much ado to defend his continental dominions against James and Roger. In 1291 James succeeded Alphonso in the kingdom of Aragon, and left Frederick not king, according to the entail, but only his lieutenant in Sicily.

Frederick was the real restorer of Sicilian independence. He had come to the island so young that he felt as a native. He defended the land stoutly, even against his brother. For James presently played Sicily false. In 1295 he was reconciled to the church and released from all French claims on Aragon, and he bound himself to restore Sicily to Charles. But the Sicilians, with Frederick at their head, disowned the agreement, and in 1296 Frederick was crowned king.

Thus the great island of the Mediterranean again became an independent power.

There is no need to dwell at length on the Sicilian history of the last five hundred years. The descendants of Frederick did not form a great dynasty. Under him and after him Sicily played a part in Italian affairs, invading and being invaded on behalf of the Ghibelline cause. But it was torn by dissensions between Spanish and Italian factions, and handed to and fro between one Spanish king and another. At last Ferdinand the Catholic (1479–1515), king by inheritance of Aragon and of Sicily beyond the pharos, conquered the continental Sicily, and called himself king of the Two Sicilies. Both were now ruled by Spanish viceroys. In Charles the First (1516–1555)—Charles of Anjou is not reckoned—Sicily had a third imperial king, and once more became the starting-point for African warfare. Philip, already king of Naples, became king of the Two Sicilies at the abdication of his father, and the two crowns passed along with Castile and Aragon till the division of the Spanish dominions. Under the foreign rule the old laws were trampled under foot. Three risings took place, that of Messina in 1672, with pretended French help, which led to deeper subjection. At the death of Charles the Second in 1700, Sicily acknowledged the French claimant Philip; but the peace of Utrecht made it the kingdom of Victor Amadeus of Savoy (1713–1720). He was crowned at Palermo; but he had to withstand Spanish invasion, and to exchange Sicily for the other insular crown of Sardinia. Both Sicilies now passed to the emperor Charles the Sixth, the fourth imperial king, who also is passed by in

Sicilian reckoning. Charles the Third is the Spanish prince of the house of Bourbon who won both Sicilies from the Austrian, and who was the last king crowned at Palermo (1735).

The wars of the French Revolution again parted the Two Sicilies. In 1798 Ferdinand the Fourth (1759–1825) withdrew to the island before the French armies. In 1805 he withdrew again, while Joseph Buonaparte and Joachim Murat reigned on the mainland as kings of Naples. Under the Bourbon rule, besides the common grievances of both kingdoms, Sicily had specially to complain of being treated as subordinate to Naples. But from 1806 to 1815 Sicily, practically a separate kingdom under British protection, enjoyed a measure of wellbeing such as it had not had for some ages, and in 1812 a constitution was established. The European settlement of 1815 brought back the Bourbon to his continental kingdom. Ferdinand the First became a constitutional king over the United Kingdom of the Two Sicilies. This was equivalent to the suppression of the separate constitution of the island, and before long all constitutional order was trodden under foot. In 1820, and also in 1836 under Francis the First, Sicily rose for freedom and separation. This last time the island was bound yet more firmly to continental rule. In the general stir of 1848 Sicily again proclaimed her independence, and sought for herself a king in the house of Savoy. Again were the liberties of Sicily trodden under foot; and, in the last change of all, the deliverance wrought by Garibaldi in 1860, if not her liberties, her ancient memories were forgotten. Sicily became part of a free kingdom; but her king does not bear her style, and he has not taken the crown of Roger. The very name of Sicily has been wiped out; and the great island now counts only as seven provinces of an Italian kingdom.

PART II.—GEOGRAPHY AND STATISTICS.

The island of Sicily (Ital. *Sicilia*) belongs to the kingdom of Italy, being separated from the mainland only by the narrow (about two miles wide) but deep Straits of Messina. It is nearly bisected by the meridian of 14° E., and by far the greater part lies to the south of 38° N. Its southernmost point, however, in 36° 40′ N. is 40′ to the north of Point Tarifa, the southernmost point of Spain and of the continent of Europe. In shape it is triangular, whence the ancient poetical name of *Trinacria*, referring to its three promontories of Pelorum (now Faro) in the northeast, Pachynum (now Passaro) in the southeast, and Lilybæum (now Boeo) in the west. Its area, exclusive of the adjacent small islands belonging to *compartimento*, is, according to the recent planimetrical calculation of the Military Geographical Institute of Italy, 9,860 square miles—considerably less than one-third of that of Ireland; that of the whole *compartimento* is 9,935 square miles.

The climate of Sicily resembles that of the other lands in the extreme south of Europe. As regards temperature, it has the warm and equable character which belongs to most of the Mediterranean region.

The flora of Sicily is remarkable for its wealth of species; but, comparing Sicily with other islands that have been long separated from the mainland, the number of endemic species is not great.

Outside of the tree region wheat is by far the most important product. At the present day Sicily is still a rich granary, as it was in ancient times when Greek colonies flourished in the south and east, and later under the supremacy of Rome. In all three-fourths of the cultivated surface is estimated to be covered with cereals.

Manufacturing industry is little developed in the island, and besides agriculture mining is the only important occupation of the people. The chief mineral is sulphur, Sicilian sulphur being indeed the most valuable mineral product of Italy. There are about 300 mines in operation in the provinces of Girgenti, Caltanissetta, Catania, and Palermo, employing about 27,000 people. The sulphur is found in a particular formation of the Upper Miocene, and is separated from the ore by fusion in a primitive kind of furnace called *calcaroni*, in most of which part of the sulphur is used as fuel. With the exception of a small quantity, which is used in the islands for the vineyards, all the sulphur is exported, chiefly to England, France, Belgium, and the United States, and the production goes on increasing, notwithstanding the lowering of the price, due to the extraction of sulphur from iron pyrites obtained elsewhere.

SICKINGEN, FRANZ VON, a powerful German baron, was born at Sickingen, Baden, the castle of his family, on March 1, 1481. He was the greatest of those Rhenish knights who held their lands immediately of the emperor, and was much esteemed by Maximilian I. and by Charles V., to both of whom he rendered good service in war. He was killed in 1523.

SICKLE. See SCYTHE.

SICYON was a city in the east of Achaia, Greece, about two miles inland from the Corinthian Gulf, situated on and below a hill in the angle formed by the confluence of the rivers Asopus and Helisson; the site is now occupied by the village of Vasilika.

SIDDONS, SARAH, English actress, was the eldest of twelve children of Roger Kemble, the manager of a company of strolling players, and his wife Sarah Ward, and was born in the "Shoulder of Mutton" public house, Brecon, Wales, July 5, 1755. She was familiar with the stage from her earliest youth. It was while playing at Cheltenham in the year 1774 that Mrs. Siddons met with the earliest decided recognition of her great powers as an actress. After a very successful engagement at Bath from 1778 to 1782, she accepted an offer from Drury Lane, when her appearance in Southern's *Isabella* was one continued triumph, only equaled in the history of the English stage by that of Garrick's first night at Drury Lane in 1741 and that of Edmund Kean's in 1814. In her earlier years it was in scenes of a tender and melting character that she exercised the strongest sway over an audience; but in the performance of Lady Macbeth, in which she appeared February, 1785, it was the grandeur of her exhibition of the more terrible passions as related to one awful purpose that held them spellbound. In Lady Macbeth she found the highest and best scope for her gifts. After Lady Macbeth she played Desdemona, Rosalind, and Ophelia, all with great success; but it was in Queen Catherine—which she first played on her brother's spectacular revival of *Henry VIII.* in 1788—that she discovered a part almost as well adapted to her peculiar powers as that of Lady Macbeth. Mrs. Siddons formally retired from the stage June 29, 1812, but occasionally appeared on special occasions even when advanced in years. In private life she enjoyed the friendship and respect of a wide circle, including many of the most eminent persons of her time. She died at London on June 8, 1831.

SIDI-BEL-ABBES, a chief town of an arrondissement in the department of Oran, Algeria, lies forty-eight miles by rail to the south of that town, at an elevation of 1,552 feet above sea-level, on the right bank of the Mekerra (afterward the Sig), and surrounded by a plain which is dominated by the escarpments of Mount Tessala. Population 1890, 17,000.

SIDMOUTH, VISCOUNT. See ADDINGTON, HENRY.

SIDNEY, or **SYDNEY, ALGERNON**, was the second son of Robert, second earl of Leicester, and of Dorothy Percy, daughter of Henry, earl of Northumberland, and was born at Penshurst, Kent, England, in 1622. As a boy he showed much talent, which was carefully trained under his father's eye. In 1632 with his elder brother he accompanied his father on his mission as ambassador extraordinary to Christian IV. of Denmark, whom he saw at Rendsburg. In May, 1636, Sidney went with his father to Paris, where he became a general favorite, and from there to Rome. In October, 1641, he was given a troop in his father's regiment in Ireland, of which his brother, Lord Lisle, was in command. In August, 1643, the brothers returned to England. On May 10, 1644, Algernon was made captain of horse in Manchester's army, under the Eastern Association. He was shortly afterward made lieutenant-colonel, and charged at the head of his regiment at Marston Moor (July 2d), where he was wounded and rescued with difficulty. On April 2, 1645, he was given the command of a cavalry regiment in Cromwell's division of Fairfax's army, was appointed governor of Chichester on May 10th, and in December was returned to parliament for Cardiff. In July, 1646, his regiment was ordered to Ireland, and he was made lieutenant-general of horse in that kingdom and governor of Dublin. He was soon (April 8th), however, recalled by a resolution of the House passed through the interest of Lord Inchiquin. On May 7th he received the thanks of the House of Commons. On October 13, 1648, he was made lieutenant of Dover castle, of which he had previously been appointed governor. On May 15, 1649, he was a member of the committee for settling the succession and for regulating the election of future parliaments. Sidney lost the governorship of Dover, however, in March, 1651, in consequence, apparently, of a quarrel with his officers. He then went to the Hague, where he quarreled with Lord Oxford at play, and a duel was only prevented by their friends. He returned to England in the autumn. Upon the restoration of the Long Parliament, May 7, 1659, Sidney again took his seat, and was placed on the council of state. He showed himself in this office especially anxious that the military power should be duly subordinated to the civil. When the restoration of Charles II. took place Sidney left Sweden, to which he had been sent by the protectorate June 28, 1660, bringing with him from the king of Sweden a rich present in testimony of the estimation in which he was held. Sidney went first to Copenhagen, and then, being doubtful of his reception by the English court, settled at Hamburg. His father was now very ill, and after much difficulty Sidney obtained leave to come to England in the autumn of 1677. He soon became involved in political intrigue, joining, in general, the country party, and holding close communication with Barillon, the French ambassador. In the beginning of 1679 he stood for Guildford, and was warmly supported by William Penn, with whom he had long been intimate, and to whom he afforded assistance in drawing up the constitution of Pennsylvania. He was defeated by court influence, and his petition to the House, complaining of an undue return, never came to a decision. His *Letters to Henry Savile*, written at this period, are of great interest. He was in Paris apparently only for a short time, in November, 1679. Into the prosecution of the Popish Plot Sidney threw himself warmly, and was among those who looked to Monmouth, rather than to Orange, to take the place of James in the succession, though he afterward disclaimed all interest in such a question. He now stood for Bramber (Sussex), again with Penn's support, and a double return was made. He is reported on August 29, 1679, as being elected for Amersham (Buckingham) with Sir Roger Hill. When parliament met, however, in October, 1680, his election was declared void.

For a long while Sidney kept himself aloof from the duke of Monmouth, to whom he was introduced by Lord Howard. After the death of Shaftesbury, however, in November, 1682, he entered into the conferences held between Monmouth, Russell, Essex, Hampden, and others. That treasonable talk went on seems certain, but it is probable that matters went no further. The watchfulness of the court was, however, aroused, and on the discovery of the Rye House plot, Sidney, who had always been regarded in a vague way as dangerous, was arrested while at dinner on June 26, 1683. His papers were carried off, and he was sent at once to the Tower on a charge of high treason. For a considerable while no evidence could be found on which to establish a charge. Jeffreys, however, was made lord chief-justice in September; a jury was packed; and, after consultations between the judge and the crown lawyers, Sidney was brought to listen to the indictment on November 7th. The trial, which began November 21st, was conducted with a shameless absence of equity. The last days of Sidney's life were spent in drawing up his *Apology* and in discourse with Independent ministers. He was beheaded on the morning of December 7, 1683. His remains were buried at Penshurst.

SIDNEY, **SIR PHILIP**, although killed at the early age of thirty-two, was one of the most conspicuous figures at the court of Elizabeth, was known to the leading statesmen of Europe as a soldier and statesman of the highest promise, took a permanent place in history and legend as a romantic hero, and in literature is distinguished as the author of the first important body of English sonnets and a writer whose works mark a distinct advance in English prose. He was born at Penshurst in Kent on November 29, 1554. The historical truth of the famous incident at the battle of Zutphen (on September 22, 1586), when the wounded hero passed a cup of water to a dying soldier, has been questioned; but it is a matter of fact that he owed his death to an impulse of romantic generosity. The lord marshal happening to enter the field of Zutphen without greaves, Sidney cast off his also, to put his life in the same peril, and thus exposed himself to the fatal shot.

His death took place fifteen days later, on October 7, 1586, at Arnheim.

SIDNEY, described as a handsome post-village and the capital of Shelby county, Ohio, is situated on the Miami river, 100 miles north of Cincinnati and forty miles from Dayton. The Miami and Erie canal passing through the village, also the Cincinnati, Hamilton and Dayton and the Cleveland, Columbus, Cincinnati and Indianapolis railroads, afford abundant transportation, accommodations to all points in the State, as also to eastern and western markets. The country tributary to Sidney is exclusively agricultural, and trade and manufactures in the village are correspondingly active. Among the industries are agricultural implement works, saw and planing mills, wheel, spoke and bent wood factories, machine shops, furniture factories, cornice works, the manufacture of school desks and extensive pottery and tile works. There are two weekly papers in the village, two banks, ten churches, an opera-house, a court-house, public hall, public library, a union school and graded schools, gas, water and electric light works and one or more parks. The population was 3,800 in 1880, and 5,000 in 1890.

SIDON (Arab. *Saida*), long the principal city of PHŒNICIA (*q.v.*), and even in the Middle Ages a place of importance, but now little more than a mere village, is situated on the Syrian coast in 33° 36′ N. latitude, and 35° 20′ 9″ E. longitude, about midway between Sur (Tyre) and Beirut (Beyrout). The ancient city extended some 800 yards farther inland, over ground now occupied by luxuriant fruit-gardens, on the produce of which the inhabitants of the town live. Of its 9,000 inhabitants 7,000 are Mohammedans; there are a number of institutions conducted by Catholic and Protestant Christians. In the neighborhood are large Phœnician burial-places, which have been partially explored by Renan; the natives also engage in the search for antiquities. The principal finds are sarcophagi, and next to these sculptures and paintings. The most important discovery hitherto made has been that of the sarcophagus of Eshmunazar with a long inscription.

SIDONIUS APOLLINARIS. See APOLLINARIS SIDONIUS.

SIEBENBÜRGEN. See TRANSYLVANIA.

SIEBOLD, CARL THEODOR ERNST VON, physiologist and zoölogist, the son of a physician and a descendant of what Oken called the "Asclepiad family of Siebolds," was born at Würzburg on February 16, 1804. Educated in medicine and science chiefly at the university of Berlin, he became successively professor of zoölogy, physiology, and comparative anatomy in Königsberg, Erlangen, Freiburg, Breslau, and Munich. He was also a laborious and successful helminthologist (see PARASITISM) and entomologist, in both capacities contributing many valuable papers to his journal, which he continued to edit until his death in 1885.

SIEBOLD, PHILIPP FRANZ VON, scientific explorer of Japan and elder brother of the physiologist noticed above, was born at Würzburg, Germany, on February 17, 1796. In 1824 he published *De Historiæ Naturalis in Japonia Statu*, and in 1832 his splendid *Fauna Japonica*. His knowledge of the language enabled him also in 1826 to issue from Batavia his *Epitome Linguæ Japonicæ*. In 1854 he published at Leyden *Urkundliche Darstellung der Bestrebungen Niederlands und Russlands zur Eröffnung Japans*. In 1359 Siebold undertook a second journey to Japan, and was invited by the emperor to his court. He died at Munich on October 18, 1866.

SIEDLCE (Russ. *Syedlets*), a government of Russian Poland, between the Vistula and the Bug, having Warsaw on the northwest, Lomza on the north Grodno and Volhynia on the east, Lublin and Radom on the south. Its area is 5,535 square miles.

Of the total surface of the government only 184,760 acres are unproductive; 695,420 acres are covered with forests; 1,703,100 are under crops, and 611,260 under meadows and pasture land. The population only increases at the rate of 0.75 per cent a year, and in 1884 numbered 630,240.

SIEDLCE, capital of the above government, is situated fifty-seven miles east-southeast of Warsaw, on the Brest-Litovsk railway. Its population was 12,950 in 1882.

SIEGE. See FORTIFICATION.

SIEGEN, an ancient mining and manufacturing town of Prussia, in the province of Westphalia, is situated forty-seven miles to the east of Cologne on the Sieg. The population in 1880 was 15,024, of whom 3,632 were Roman Catholics and 111 Jews.

SIEGFRIED, a hero of German romance.

SIEMENS, SIR WILLIAM, christened Carl Wilhelm, an eminent inventor, engineer, and natural philosopher, was born at Lenthe in Hanover on April 4, 1823. After some years spent in active invention and experiment at mechanical works near Birmingham, England, he went into practice as an engineer in 1851. He labored mainly in two distinct fields, the applications of heat and the applications of electricity, and was characterized in a very rare degree by a combination of scientific comprehension with practical instinct. He died in London on November 19, 1883.

SIENA, a city of Italy, and one of the most characteristic of Tuscany, stands (43° 19′ N. latitude, 11° 19′ E. longitude) on a hill near the mountainous region of Chianti, the Maremma, and Val di Chiana. It is sixty miles by rail south of Florence and 160 northwest of Rome. The city possesses a university, founded in 1203, and limited to the faculties of law and medicine.

History.—The origin of Siena, like that of other Italian cities, is lost in a mist of legendary tradition. It was probably founded by the Etruscans, and then falling under the Roman rule became a colony in the reign of Augustus, or a little earlier, and was distinguished by the name of *Sæna Julia*. Few memorials of the Roman era or of the first centuries of Christianity have been preserved, and none at all of the interval preceding the Lombard period. We have documentary evidence that during this epoch, in the reign of Rotaris (or Rotari), there was a bishop of Siena named Mouro. Attempts to trace earlier bishops as far back as the fifth century have yielded only vague and contradictory results. Under the Lombards the civil government was in the hands of a *gastaldo*, under the Carolingians of a count, whose authority, by slow degrees and a course of events similar to what took place in other Italian communes, gave way to that of the bishop, whose power in turn gradually diminished and was superseded by that of the consuls and the commonwealth.

In 1387 quarrels with Florence on the subject of Montepulciano led to an open war, that was further aggravated by the interference in Tuscan affairs of the ambitious duke of Milan, Gian Galeazzo Visconti. With him the Sienese concluded an alliance in 1389 and ten years later accepted his suzerainty and resigned the liberties of their state. But in 1402 the death of Gian Galeazzo lightened their yoke. In that year the first plot against the Viscontian rule was violently repressed; but in the following year a special *balìa*, created in consequence of that riot, annulled the ducal suzerainty and restored the liberties of Siena.

Cosimo I. de' Medici being granted the investiture of the Sienese state by the patent of Philip II. of Spain, dated July 3, 1557, took formal possession of the city on the 19th of the same month. A lieutenant-general was appointed as representative of his authority; the council of the *balìa* was reconstituted with twenty members chosen by the duke; the consistory and the general council were left in existence but deprived of their political autonomy. Thus Siena was annexed to the Florentine state under the same ruler and became an integral part of the grand duchy of Tuscany. Nevertheless it retained a separate administration for more than two centuries, until the general reforms of the grand duke Pietro Leopoldo, the French domination, and finally the restoration swept away all differences between the Sienese and Florentine systems of government. In 1859 Siena was the first Tuscan city that voted for annexation to Piedmont and the monarchy of Victor Emmanuel II., this decision (voted June 26th) being the initial step toward the unity of Italy.

SIERADZ, a town of Russian Poland, in the government of Kalisz (Kalish), situated on the Warta, 127 miles southwest of Warsaw. Sieradz, after having been the chief town of a *voivództvo*, has now no importance. Its population was 15,040 in 1884.

SIERRA LEONE, a British colony on the West Coast of Africa, the capital of which, Freetown, lies in 8° 39′ N. latitude and 13° 14′ W. longitude. It consists of Sierra Leone proper, part of the Quiah country to the east, Tasso Island, etc., in the Sierra Leone estuary, part of the Bullom country to the north, the Los Islands to the north of the Mellicoury (Mellacorée) river, the Banana Islands to the south of the main settlement, Sherbro (Sherboro) Island and part of the Sherbro country, the Turner peninsula, W. E. Tucker's territory, and generally all the seaboard south to the mouth of the Manoh (Manna) river, which is now recognized as the northern boundary of Liberia. The British territory and protectorate are estimated to have an area of about 3,000 square miles; and though it has not all been formally annexed, the whole coast region from the mouth of the Scarcies in 8° 55′ N. latitude to that of the Manoh in 6° 55′ may be considered as British, at least to the exclusion of any other European sovereignty.

Among the productions of the peninsula are cola nuts, ginger (in large quantities), malagetta pepper, castor-oil, maize, cassava, ground nuts, and (in small quantities) cotton. Native coffee was discovered in Quiah in 1796, and the growing of Liberian coffee and coca has since 1880 been attempted with some success. According to the census of 1880, the population of the colony was 60,446.

History.—Sierra Leone (in the original Portuguese form Sierra Leona) was known to its native inhabitants as Romarong or the Mountain, and received the current designation from the Portuguese discoverer Piedro de Cintra (1462) on account of the lion-like roaring of the thunder on its hill-tops. An English fort was built on the Sierra Leone estuary toward the close of the seventeenth century, but was soon afterward abandoned. In 1786 Doctor Smeathman proposed his scheme for founding on the peninsula a colony of liberated African slaves; and in 1787 Captain Thompson, having purchased the territory from Naimbana or King Tom of the Timmanehs, commenced the settlement with 400 Negroes and 60 Europeans. Owing mainly to the utter shiftlessness of the settlers and partly to a hostile attack by a body of natives, this first attempt proved a complete failure. In 1791 Falconbridge collected the surviving fugitives and laid out a new settlement (Granville's Town); and the promoters of the enterprise—Granville Sharp, William Wilberforce, William Ludlam, Sir Richard Carr Glynn, etc., hitherto known as the St. George's Bay Company—obtained a charter incorporating them as the Sierra Leone Company (31 Geo. III. c 55). In 1792 Clarkson introduced into the colony 1,200 Negroes from the Bahamas and Nova Scotia. Afzelius the botanist and Nordenskjöld the mineralogist were sent out to explore the capabilities of the country; but the latter soon after died at Port Lokko (Port Logo). In 1794 the settlement, which had been again transferred to Freetown, was plundered by the French. An attempt to found a similar colony on Bulama (mouth of the Rio Grande) was a complete failure (Dalrymple and Beaver). In 1800 the company was allowed to make laws not repugnant to those of England, but in 1807 it was glad to transfer all its rights to the crown. Sydney Smith's jest that Sierra Leone had always two governors, one just arrived in the colony and the other just arrived in England, is but a slight exaggeration. There were eight changes between 1808 and 1824, and as many between 1865 and 1881. The names of Zachary Macaulay, Sir Charles Macarthy, Sir Stephen J. Hill, Sir Arthur Kennedy, Sir Samuel Rowe, and A. E. Havelock deserve to be mentioned. In 1825 General Turner concluded a treaty placing Turner's peninsula, etc., under British protection; but effect was not given to it till 1881. In 1875 the mouths of the Kates, Kamaranka, Bompé, and Cockboro were annexed, and in 1883 the seaboard toward the Liberian frontier. British influence has been peacefully advancing inland under Sir Samuel Rowe. In 1866 Sierra Leone was made the seat of government of the new general government of the British settlements on the west coast of Africa (comprising Sierra Leone, Gambia, the Gold Coast, and Lagos, each of which was to have a legislative council); but in 1874 the Gold Coast and Lagos were raised to a separate government, and the Gambia alone remains attached to Sierra Leone.

SIEYÈS, Emmanuel Joseph, one of the chief political thinkers and writers of the period of the French Revolution and the first empire, was born at Fréjus (Var) on May 3, 1748. His chief exploits at this period seem to indicate an extreme facility of opinion, especially toward the last of that time.

In the year 1795 the ex-abbé was commissioned by the Convention to The Hague, where he successfully concluded an offensive and defensive alliance between the United Provinces and France. Without Sieyès no framing of a constitution could be attempted, and he was accordingly appointed member of a commission to draw up organic laws, the constitution of 1793 having been found unworkable. When the commission brought forward its report Sieyès did not dissent; but he proposed to the Convention a separate scheme of his own the specialty of which was the provision for the appointment of a constitutional jury which should be charged with the duty of revising all legislative decrees against which the challenge was brought that they were themselves at variance with the constitution. His scheme was, however, rejected in favor of the new constitution, and from that moment he became its secret enemy. He was elected one of the first directory of five, but he declined the honor. In 1798 he was appointed the plenipotentiary of France to Prussia, where he was received with great honor and where he speedily began to plot against the government he represented. He communicated his views to Napoleon, then in Egypt. Meanwhile (1799) he was again elected to the directory, and, his plans being ripe, he accepted office. Then came the *coup d'état* of 18th Brumaire (November 9, 1799), in which Sieyès took so important a part, but in which he was unquestionably overborne by the genius and audacity of Bonaparte. The provisional consulate composed of Napoleon, Sieyès, and Ducos, lasted but a few weeks. After a little Sieyès was a count of the empire and the proprietor of Crosne (Seine-et-Oise), while Napoleon was able to boast of how he had bribed the ex-abbé out of his constitutional views. Amid the political changes of France, Sieyès, on the second return of the Bourbons, fled to Brussels; but after the revolution of 1830 he felt it safe to return to Paris, where he died on June 20, 1836.

SIGALON, Xavier, French painter, born at Uzès (Gard) toward the close of 1788, was one of the few leaders of the romantic movement who cared for treatment of form rather than of color. He died in Rome, of cholera, on August 9, 1837.

SIGHTS. - A sight for shooting may be defined as an apparatus for determining the point of impact of a projectile, in popular language, for "aiming" or "laying." In its simplest form it is scarcely recognizable as a sight. When an expert cricketer throws the ball straight to the wicket the eye and the hand assume that relative position which experience has taught to be correct, and the eye may be said to lay the hand on the wicket by means of the intervening muscles, which therefore constitute the sight. The next step toward accuracy is seen in the ordinary shot-gun, where the eye is placed over and behind the center of the breech; and sees that a bead placed above the center of the muzzle is in a direct line with the desired point of impact. If we add a notch at the center of the breech to fix the eye more accurately, we shall have the hind-sight, the fore-sight, and the object brought into line, when the gun is correctly laid.

This would constitute a perfect direct mechanical sight if we could assume (1) that the projectile was not subject to gravity, (2) that it had no tendency to deviate if passing through a calm atmosphere; (3) that the object aimed at was stationary; (4) that the weapon discharged was stationary; (5) that the atmosphere was still.

(1) The first condition is never realized: the projectile begins to drop toward the earth the moment it leaves the gun, and therefore to make it strike at a given level its first direction must be above this level. Hence the hind-sight must be raised to make the necessary correction.

(2) Secondly, the projectile deviates of its own accord from the vertical plane. If it is unrifled, its imperfections of manufacture cause errors which may be in any direction, and which, therefore, cannot be compensated by any method of sighting. If it is rifled, the spin given to it renders these imperfections of little consequence, but, on the other hand, confers a constant tendency to deviation.

(3) Every one who shoots birds on the wing is acquainted with the difficulties appertaining to the nonfulfillment of the third condition. The expert game-shot aims ahead of the object more or less, according to his judgment of the relative velocities of the projectile and the target and of the distance of the latter. Practice makes this comparatively easy at the short ranges of ordinary sport; but in the case of a heavy fort gun firing at a vessel under full steam 3,000 yards off, it becomes evident that considerable allowance must be made.

(4) The fourth condition is rarely met with except on board ship, and it is evident that it obeys the same laws and is subject to the same kind of correction as the third. The correcting angle, however, is here given by the ship's speed across the line of fire and the starting velocity of the projectile.

(5) The fifth source of error differs from the others in being variable and uncontrollable. A gust of wind may spoil the best shot; and, though it is possible in practice to allow for deviation due to a steady breeze, yet the force and even the direction of the moving air differ so frequently at different parts of the trajectory that it has hitherto been found impossible to devise any satisfactory correction beyond that obtainable from knowledge of the point of impact of a previous shot.

The forms of sights preferred by experts for accurate laying are extremely varied, and nothing but practice can determine the most suitable to individual eyesight.

To secure greater accuracy than can be attained by the eye, telescopes are resorted to. It is obviously easy to apply to a match rifle a telescope with sufficient strength to resist the jar of firing, and to provide it with the necessary fittings for elevation, deflection, etc.; but with ordnance the shock is much greater, and the telescope has to be removed before firing. This renders it difficult to secure a truly accurate attachment.

The application of electricity to the laying and firing of heavy guns has caused a remarkable development of the systems of sighting. Suppose a battery of guns to command a channel, and that it is desired to concentrate their fire on a hostile vessel endeavoring to run past. Each detachment lays its gun both for elevation and direction in accordance with the figures which appear on a dial in the emplacement. Each dial is worked by electricity from an observing station away from the smoke and noise of the fort; as the hostile vessel approaches the observing officer follows its course on a chart. The observing station is placed at a considerable height above the water-line, so that a vertical base of calculation is obtained. Hence the angle of depression given by the telescope when pointing at the object indicates the range, and the direction of the telescope indicates the line of fire; these indications are automatically corrected for the positions of the guns. In practice the officer follows the ship's course, signals to the battery the line and distance of a point a little ahead of the vessel, and receives a signal from the battery that the guns are laid and ready. He then fires electrically as the ship is coming into the expected position.

SIGISMUND, German emperor, was born on February 14, 1362. After the death of his father, the emperor Charles IV., he received the margraviate of Brandenburg. Sigismund was crowned emperor in 1433, having obtained the Italian crown two years before. He died at Znaim in Moravia on December 9, 1437. He possessed considerable intellectual ability, but he never did full justice to his powers—being recklessly extravagant and of a wayward and impulsive temper.

SIGISMUND, the name of three kings of Poland. (See POLAND.)

SIGMARINGEN, the seat of government of the Prussian administrative division of the same name, is a small town on the Danube with (1880) 4,154 inhabitants.

SIGNALS, NAVAL. A system of naval signals comprises different methods of conveying orders or information to or from a ship in sight and within hearing, but at a distance too great to permit of hailing—in other words, beyond the reach of the voice, even when aided by the speaking-trumpet. Signals are divided into classes according to the instruments with which and the circumstances under which they are made. There are sight and sound signals; flag, semaphore, fixed lantern, flashing, firework, horn or steam-whistle, and gun signals; day, night, fog, and distant signals. Besides these, there are other divisions, such as general, vocabulary, evolutionary, etc., which depend upon technical considerations and are matters of arrangement.

In the American navy, which is copied by most others, sight-signals are made with flags, the semaphore, "flashes," fixed lanterns, and occasionally with fireworks, and for "distant" signals with flags, balls, and pendants displayed on account of shape but not of color. Sound-signals are made with horns, steam-whistles, and guns. There are two sets of flags—one of ten, numbered from 1 to 10, and another of twenty-one, called after letters of the alphabet. There are also pendants and a few special flags. The numbered flags are used with the general signal-book, a kind of dictionary in which figures stand opposite sentences conveying orders or announcements. Opposite 123 might stand "hoist in all boats," which would mean that, when the flag called 1 was hoisted with 2 beneath it and 3 beneath 2, the ship or ships addressed—indicated by a special flag or by pendants—were ordered to hoist all boats in. The lettered flags are used with the vocabulary signal-book, in which opposite collections of letters are put single words or small groups of words. Thus, if ABC were opposite the word "admiral" and STO opposite "will sail at noon," when the first three flags were hoisted the signalman on board each ship addressed would note them down with their signification. When all addressed had acknowledged the first "hoist" the flags would be hauled down and STO would be hoisted, to be acknowledged and noted in like manner. The admiral would thus have made known his intention of sailing at a given hour. From this it will appear that the general code is used for words of command and the vocabulary for long communications. The night signal book contains a limited number of definite orders and announcements made known by exhibiting lanterns, never more than four, arranged vertically, horizontally, or in a square. For a few signals some kind of firework is displayed. Fog-signals are made by firing different numbers of guns at fixed intervals. Owing to the slowness of flag-signaling, it is now, especially for the vocabulary and at moderate distances, largely superseded by the semaphore, an upright post with two arms moving in a vertical plane. The changed positions of the arms indicate letters and each word is spelled.

SIGNAL SERVICE. The system of signal service now in use throughout the United States was first suggested immediately prior to the Civil war by Gen. A. J. Meyer, an officer of the United States army, at that date connected with the surgeon-general's department. The difficulty of communication between various divisions of the army, particularly at points where facilities for communicating by telegraph were wanting, was the cause of serious embarrassment at times, and gave birth to the service which has since obtained. General Meyer's plan was to adopt certain principles of telegraphy, as for example the dots and dashes used to represent letters of the alphabet, substituting therefor flags, which were waved in one direction to indicate dots, and in another direction to indicate dashes. By this means operators separated at a distance of from half a mile to ten miles would be enabled to frame communications that could be readily comprehended by those to whom they were addressed. After nightfall, or at times when the atmosphere was obscured to a degree that prevented the successful employment of flags, colored lights were used and found equal to the requirements of the occasion. The plan was first utilized at points on the frontier; and when, during the progress of the Civil war, the difficulty that brought the system into existence was experienced, it was adopted, and become one of the most valuable auxiliaries enlisted in the service.

Appropriations for the support and maintenance of the system were regularly included in the bills adopted by congress for the support of the army, and its worth and efficiency were further acknowledged by the same authority in providing for the establishment of a school of instruction at Arlington, near Washington. The education there obtainable, both practical and theoretic, is designed to thoroughly equip students for the scientific work they will be called upon to execute, and results show that expectations thus indulged have been fairly realized.

When the war terminated the system had attained a high degree of perfection, its value was universally recognized, and its development was continued, with improved results. It was introduced into the navy, and was the chief impulse in the establishment of the international code. Its greatest value, however, and its most marked development, has been in connection with the furnishing of daily weather reports, also weather predictions based upon the results of scientific investigation, and which have proved invaluable to the public in providing against possible damage from storm visitations. This latter phase of the system was introduced by Prof. A. C. Abbe in 1868, when he furnished the Cincinnati chamber of commerce with data. His professional labors having commended themselves to the attention of commercial organizations in various portions of the country, led to the presentation to congress of a memorial embodying his views, and praying for an enlargement of the system, the management of which was to be intrusted to the department of signal service. This was done by congressional enactment, and reports were first promulgated by telegraph on November 8, 1870. They were occasionally accompanied by weather predictions up to November 8, 1871, at which time the present system of tri-daily predictions was introduced, and has since been not only a part but a prominent feature of the service. At noon, Washington time, observations are taken at all stations in the country and telegraphed to Washington, as also to various points en route. These reports are immediately edited, arranged and put upon a map, when bulletins of predictions, signals, etc., are issued to the associated press for transmission and dissemination, so that by the morning of the day following, the public is advised of the probable weather conditions for the ensuing twenty-four hours, in the United States, Canada and the West Indies. At all of the stations and in the leading cities signals indicative of storms, warm and cold weather, sudden changes, etc., are exhibited for the guidance of of residents, and every means known to science is adopted for the promotion of accuracy in the results obtained. In addition to these bulletins, a chronicle of the weekly changes, etc., is issued, also a monthly review of the weather and an international bulletin of observations made simultaneously all over the world. The service has steadily improved since it originated, and has come to be regarded as an indispensable department of the government. It is carefully managed, liberally maintained, enlisting in its operation a high grade of officers, and contributing information of vital interest to all classes and conditions of men. General Hazen served as chief until his death, August 24, 1880, when the position was for a brief period filled by Adjutant-General Drum. The latter was succeeded by Gen. W. B. Hazen, upon whose death, January 16, 1887, Gen. A. W. Greely, of Arctic fame, was appointed chief.

SIGNORELLI, Luca, one of the greatest of the Italian painters who ushered in the full culmination of the art under Leonardo da Vinci, Michelangelo, and Raphael, was born in Cortona—his full name being Luca d'Egidio di Ventura; he has also been called Luca da Cortona. The precise date of his birth is uncertain; but, as he is said to have died at the age of eighty-two, and as he was certainly alive during some part of 1524, the birth date of 1442 must be nearly correct. Signorelli stood in great repute not only as a painter but also as a citizen. He entered the magistracy of Cortona as early as 1488, and in 1524 held a leading position among the magistrates of his native place. In or about the year 1524 he died there.

SIKHS. See India and Punjab; also Hindustani.

SIKKIM, a native state of India, in the eastern Himalaya mountains, between 27° 9′ and 27° 58′ N. latitude, and between 88° 4′ and 89° E. longitude, and bounded on the north and northeast by Tibet, on the southeast by Bhután, on the south by the British district of Darjiling. and on the west by Nepál. It covers an area of 2,600 square miles, with an estimated population of 7,000.

SILENUS, a personage of Greek mythology, a drunken attendant of Bacchus and closely allied to the satyrs, of whom he appears as the leader. Elderly satyrs were called Sileni. The Sileni belong especially to the legends of Asia Minor, and particularly of Lydia and Phrygia. The stories as to the birth of Silenus were various. Some called him a son of Hermes, others of Pan and a nymph; others said that he sprang from the drops of the blood of Sky. Sometimes he figures as the guardian of Dionysus. In spite of his dissipated habits he possessed a large stock of general information, which, however, like Proteus, he only imparted on compulsion

SILESIA (Germ., *Schlesien*), a district in the eastern part of Germany, between 49° 28′ and 52° 7′ N. latitude and 13° 50′ and 19° 20′ E. longitude, was formerly united with the kingdom of Bohemia in the form of a duchy (or rather group of duchies), and is now unequally shared between Prussia and Austria. Geographically it is divided into Lower and Upper Silesia, the whole of the former and part of the latter belonging to Prussia. The total area is 17,540 square miles.

The earliest notices of Silesia are extremely vague, nor can we exactly define the scope of the name in the first 1,000 years of our era. It seems to have formed part of the great but short-lived kingdom of MORAVIA (*q.v.*) in the ninth century, and afterward oscillated between the neighboring kingdoms of Bohemia and Poland, becoming definitely incorporated with the latter at the end of the tenth century. Christianity was introduced about the year 960, and from 1000 on we have an unbroken list of bishops of Breslau. The first contact of Germany with Silesia was disastrous to the former, as it was on the fastnesses of Silesia that Henry V. squandered his strength in his unsuccessful expedition against Poland in 1109. More fortunate was the intervention of Frederick Barbarossa in 1163 in behalf of the three sons of the dispossessed Ladislaus, a member of the Polish royal family of the Piasts. Under his grandson Henry the Bearded (1202–1238) the Germanization of Silesia made rapid progress, and the duchy at that time may be looked upon as a bulwark or mark against the Slavs in the southeast of Germany, just as the duchy of Prussia was in the northeast. Henry extended his sway much beyond the limits of Silesia, and in fact united under his scepter nearly three quarters of the old Polish dominions.

The progress of the three Silesian wars is recounted in the article AUSTRIA. At the peace of Hubertusburg (1763) Prussia was left in possession of nearly the whole of Silesia, with the frontier as it still exists. Frederick exerted himself to atone for the evils brought upon the district through the ravages of war by introducing colonists and capital, reforming the administration, granting complete religious liberty, and the like. That this seed did not fall on ungrateful soil seems proved by the modern prosperity of Silesia and the loyalty with which its inhabitants have clung to the Prussian cause.

PRUSSIAN SILESIA, the largest province of Prussia, with an area of 15,560 square miles, forms the southeastern limb of the kingdom, and is bounded by Brandenburg, Posen, Russian Poland, Galicia, Austrian Silesia, Moravia, Bohemia, and the kingdom and province of Saxony. Besides the bulk of the old duchy of Silesia, it comprises the countship of Glatz, a fragment of the Neumark, and part of Upper Lusatia, taken from Saxony in 1815. The province is divided into three governmental districts—Liegnitz and Breslau corresponding to lower Silesia, while Oppeln takes in the greater part of upper, southern, or mountainous Silesia. At the census of 1880 the population of Silesia was 4,007,925.

AUSTRIAN SILESIA, the part of the duchy that remained to Austria after the Seven Years' War, is a mere fraction of the whole, its area being only 1,980 square miles, or about one-eighth of that of Prussian Silesia. It falls into two small portions of territory, separated by a projecting limb of Moravia and surrounded by Prussian Silesia, Moravia, Hungary, and Galicia. Until 1849 it was for administrative purposes reckoned a part of Moravia, but since that year it has been a crownland of the Austrian empire (the smallest of all), with the style of duchy. The population in 1885 was 577,593.

SILICA, the only known oxide of silicon (see CHEMISTRY), occurs native in a great variety of forms, which, however, correspond to only the four distinct species of QUARTZ (*q.v.;* see also MINERALOGY), tridymite, OPAL (*q.v.*), and siliceous earth. Ordinary quartz-rock and sand are more impure forms of quartz. Tridymite differs from quartz only by a lower specific gravity, and in crystallometric details; the crystals are as a rule arranged in triplets—hence the name. Siliceous earth when dry forms a very voluminous, soft, fine powder; it consists of the shells of *Infusoria*. As a chemical species it differs little from opal. Siliceous earth, having a very low rate of thermal conductivity, serves well as a stuffing for the hollow walls of ice-chests, fire-proof safes, etc. It is used besides for the making of DYNAMITE, (*q.v.*)

SILISTRIA, or SILISTRA, a fortified town on the south side of the Danube, seventy-five miles below Rustchuk, and 150 miles from the mouth of the river, is now at the head of a district in the principality of Bulgaria. In 1881 the population was 10,657.

SILIUS ITALICUS, a Latin epic poet, was born in 25 and died 101 A.D. His birthplace is unknown. He was a great student and patron of literature and art, and a passionate collector. Two great Romans of the past, Cicero and Virgil, were by him idealized and veritably worshiped; and he was the happy possessor of their estates at Tusculum and Naples. The later life of Silius was passed on the Campanian shore, hard by the tomb of Virgil, at which he offered the homage of a devotee. Stricken by an incurable disease, he starved himself to death, keeping a cheerful countenance to the end.

SILK is a fibrous substance produced by many insects, principally in the form of a cocoon or covering within which the creatures are inclosed and protected during the period of their principal transformations. The webs and nets, etc., formed by spiders are also of silk. But the fibers used for manufacturing purposes are exclusively produced by the mulberry silk-moth of China, *Bombyx mori*, and a few other moths closely allied to that insect. Among the Chinese the name of the silk-worm is "si," Corean "soi"; to the ancient Greeks it becomes known as *σήρ*, the nation whence it came was to them *Σῆρες*, and the fiber itself *σηρικόν*, whence the Latin *sericum*, the French *soie*, the German *seide*, and the English *silk*.

The silk industry originated in China; and according to native records it has existed there from a very remote period. The empress Se-ling-she, wife of a famous emperor, Hwang-te (2640 B.C.), encouraged the cultivation of the mulberry tree, the rearing of the worms, and the reeling of silk. This empress is said to have devoted herself personally to the care of silkworms, and she is by the Chinese credited with the invention of the loom. A voluminous ancient literature testifies not only to the antiquity but also to the importance of Chinese sericulture, and to the care and attention bestowed on it by royal and noble families. The Chinese guarded the secrets of their valuable art with vigilant jealousy; and there is no doubt that many centuries passed before the culture spread beyond the country of its origin. Through Corea a knowledge of the silkworm and its produce reached Japan, but not before the early part of the third century.

The Silkworm.—The mulberry feeding moth, *Bombyx mori*, which is the principal source of silk, belongs to the *Bombycidæ*, a family of *Lepidoptera*, in which are embraced some of the largest and most handsome moths. *B. mori* is itself an inconspicuous moth of an ashy white color, with a body, in the case of the male, not half an inch in length, the female being a little longer and stouter. Its wings are short and weak; the fore pair are falcate, and the hind pair do not reach to the end of the body. The larva is hairless, of an ashy gray or cream color, attains to a length of from three to three and one-half inches, and is slender in comparison with many of its allies. The second thoracic ring is humped, and there is a spine-like horn or protuberance at the tail. The common silkworm produces, as a rule, only one generation during the year; but there are races in cultivation which are bivoltine, or two-generationed, and some are multivoltine. Its natural food is the leaves of mulberry trees. The silk-glands or vessels consist of two long, thick-walled sacs running along the sides of the body, which open by a common orifice—the spinneret or seripositor—on the under lip of the larva. As the larva approaches maturity these vessels become gorged with a clear, viscous fluid, which, upon being exposed to the air, immediately hardens to a solid mass. Advantage is taken of this peculiarity to prepare from fully developed larvæ, silkworm gut used for casting lines in rod-fishing, and for numerous other purposes where lightness, tenacity, flexibility, and strength are essential. The larvæ are killed and hardened by steeping some hours in strong acetic acid; the silk glands are then separated from the bodies, and the viscous fluid drawn out to the condition of a fine uniform line, which is stretched between pins at the extremity of a board. The board is then exposed to the sunlight till the lines dry and harden into the condition of gut. The preparation of gut is, however, merely an unimportant collateral manufacture. When the larva is fully mature, and ready to change into the pupa condition, it proceeds to spin its cocoon, in which operation it ejects from both glands simultaneously a line or thread about 4,000 yards in length, moving its head round in regular order continuously for three days or thereabout.

The thread so ejected forms the silk of commerce, which as wound in the cocoon consists of two filaments —one from each gland—laid side by side and agglutinated into one fiber (Fr., *bave*) by their own adhesive constituents. Under the microscope, therefore, cocoon silk presents the appearance of a somewhat flattened combination of two filaments placed side by side, being on an average from .033 to .036 mm. broad by .020 to .025 mm. in thickness. The cocoons are white or yellow in color, oviform in shape, with often a constriction in the middle. According to race, etc., they vary considerably in size and weight, but on an average they measure from an inch to an inch and a half in length, and from half an inch to an inch in diameter. They form hard, firm, and compact shells with some straggling flossy filaments on the exterior, and the interior layers are so closely and densely agglutinated as to constitute a parchment-like mass which resists all attempts at unwinding. The whole cocoon with its inclosed pupa weighs from fifteen grains for the smaller races to about fifty grains for the breeds which spin large cocoons. From two to three weeks after the completion of the cocoon the inclosed insect is ready to escape; it moistens one end of its self-made prison, thereby enabling itself to push aside the fibers and make an opening by which the perfect moth comes forth. The sexes almost immediately couple; the female in from four to six days lays her eggs, numbering 500 and upward; and, with that the life cycle of the moth being complete, both sexes soon die.

Sericulture.—The art of sericulture concerns itself with the rearing of silkworms under artificial or domesticated conditions, their feeding, the formation of cocoons, the securing of these before they are injured and pierced by the moths, and the maturing of a sufficient number of moths to supply eggs for the cultivation of the following year. The first essential is a stock of mulberry trees adequate to feed the worms in their larval stage. The leaves preferred in Europe are those of the white-fruited mulberry, *Morus alba*, but there are numerous other species which appear to be equally suitable. The soil in which the mulberry grows, and the age and condition of the trees, are important factors in the success of silkworm cultivation; and it has been too often proved that the mulberry will grow in situations where, from the nature of the leaf the trees put forth and from other circumstances, silkworms cannot be profitably reared. An elevated position with dry friable well-drained soil produces the best quality of leaves. Throughout the East the species of mulberry cultivated are numerous, but, as these trees have been grown for special purposes at least for three thousand years, they show the complex variations peculiar to most cultivated plants.

The eggs of the silkworm, called *graine*, are hatched out by artificial heat at the period when the mulberry leaves are ready for the feeding of the larvæ. These eggs are very minute—about one hundred weighing a grain; and a vast number of hatched worms may at first be kept in a small space; but the rapid growth and voracious appetite of the caterpillars demand quickly increasing and ample space. Pieces of paper punctured with small holes are placed over the trays in which the hatching goes on; and the worms, immediately they burst their shell, creep through these openings to the light, and thereby scrape off any fragments of shell which, adhering to their skin, would kill them by constriction. The rearing-house in which the worms are fed (Fr., *magnanerie*) must be a spacious, well-lighted, and well-ventilated apartment, in which scrupulous cleanliness and sweetness of air are essential, and in which the temperature may to a certain extent be under control. The worms are more hardy than is commonly supposed, and endure variations of temperature from 62° to 78° F. without any injury; but higher temperature is very detrimental. The lower the temperature at which the worms are maintained the slower is their growth and development; but their health and vigor are increased, and the cocoon they spin is proportionately bigger. The worms increase in size with astonishing rapidity, and no less remarkable is their growing voracity. Certain races molt or cast their skin three times during their larval existence, but for the most part the silkworm molts four times—about the sixth, tenth, fifteenth, and twenty-third days after hatching. As these molting periods approach the worms lose their appetite and cease eating, and at each period of change they are left undisturbed and free from noise. The worms from one ounce of graine—numbering, say, 40,000—consume in their first stage about 6 pounds of picked leaf, in the second 18 pounds, in the third 60 pounds, fourth 180 pounds, and in their final stage 1,098 pounds—in all, 1,362 pounds of mulberry leaf; but from that is to be deducted about 590 pounds of unconsumed fragments removed in the litter, giving of leaf really consumed 772 pounds. An ounce of graine so treated may yield from 80 to 120 pounds of cocoons, 85 per cent. of which consists of the weight of chrysalides and 15 per cent. of pure cocoon. The growth of the worms during their larval stage is thus stated by Count Dandolo:—

	Weight per 100.	Size in Lines.
Worms newly hatched.......	1 gr.	1
After 1st molt..................	15 "	4
" 2d "	94 "	6
" 3d "	400 "	12
" 4th "	1,628 "	20
Greatest weight and size...	9,500 "	40

When the caterpillars are mature and ready to undergo their transformation into the pupa condition, they cease eating for some time and then begin to ascend the brushwood branches or echelletes provided for them, in which they set about the spinning of their cocoons. Crowding of positions must now be guarded against, to prevent the spinning of double cocoons (*doubions*) by two worms spinning together and so interlacing their threads that they cannot be reeled. The insects complete their cocoons in from three to four days, and in two or three days thereafter the cocoons are collected, and the pupa killed to prevent its further progress and the bursting of the shell by the fully developed moth. Such cocoons as are selected for the production of graine, on the other hand, are collected, freed from the external floss, and preserved at a temperature of from 66° to 72° Fahr., and after a lapse of from eleven to fifteen days the moths begin to make their appearance. The coupling which immediately takes place demands careful attention; the males are afterward thrown away, and the impregnated females placed in a darkened apartment till they deposit their eggs.

Filature or Reeling.—When the cocoons have been gathered the chrysalides they contain are killed either by dry heat or by exposure to steam. All cocoons stained by the premature death of the chrysalides (*chiques*), pierced cocoons, double cocoons, and any from other causes rendered unreelable, are put aside for the spun silk manufacture. Then the uninjured cocoons are by themselves sorted into classes having similar shades of color, size, and quality of fiber. This assortment is of great consequence for the success of the reeling operations, as uniformity of quality and evenness and regularity of fiber are the most valuable features in raw silk. The object of reeling is to bring together the filaments (*bave*) from two or more (generally four or five, but sometimes up to twenty) cocoons, and to form them into one continuous, uniform, and regular strand, which constitues the "raw silk" of commerce. To do this, the natural gum of the cocoons which holds the filaments together must be softened, the ends of the filaments of the required number of cocoons must be caught, and means must be taken to unwind and lay these filaments together, so as to form a single uniform rounded strand of raw silk. In the most approved modern filatures there is a separate cocoon boiler (*cuiseuse*), an oblong tank containing water boiled by steam heat. In these the cocoons are immersed in rectangular perforated boxes for about three minutes, when they are transferred to the beating machine (*batteuse*), an earthenware trough having a perforated false bottom through which steam keeps the water at a temperature of from 140° to 160°. In this water the cocoons are kept stirring by small brushes rotated by mechanical means, and as the silk softens the brushes gradually rise out of the water, bringing entangled with them the loose floss, and thereby revealing the main filament of each cocoon. The cocoons are next, in sufficient number, transferred to the reeler's tray (*bacinella*), where the water is heated to about 120°. From the tray the filaments are carried through a series of porcelain and glass eyelets, so arranged that the strand returns on itself, two portions of the same strand being crossed or intertwisted for rounding and consolidation, instead of the croissage of two separate strands as in the old method. The reel to which the raw silk is led consists of a light six-armed frame, inclosed within a wooden casing having a glass frame in front, the inclosure being heated with steam pipes. To keep the strands from directly overlaying each other and so adhering, the last guide through which the silk passes has a reciprocating motion whereby the fiber is distributed within certain limits over the reel.

Throwing.—Raw silk, being still too fine and delicate for ordinary use, next undergoes a series of operations called throwing, the object of which is to twist and double it into more substantial yarn. The first operation of the silk throwster is winding. He receives the raw silk in hanks as it is taken from the reel of the filature, and putting it on a light reel of a similar construction, called the swifts, he winds it on bobbins with a rapid reciprocating motion, so as to lay the fiber in diagonal lines. These bobbins are then in general taken to the first spinning frame, and there the single strands receive their first twist, which rounds them, and prevents the compound fiber from splitting up and separating when, by the subsequent scouring operations, the gum is removed which presently binds them into one. Next follows the operation of cleaning, in which the silk is simply reeled from one bobbin to another, but on its way passes through a slit which is sufficiently wide to pass the filament, but stops the motion when a thick lump or nib is presented. In the doubling, which is the next process, two or more filaments are wound together side by side on the same reel, preparatory to their being twisted or thrown into one yarn. Bobbins to the number of strands which are to be twisted into one are mounted in a creel on the doubling frame, and the strands are passed over smooth rods of glass or metal through a reciprocating guide to the bobbin on which they are wound. Each separate strand passes through the eye of a failer, which, should the fiber break, falls down and instantly stops the machine, thus effectually calling attention to the fact that a thread has failed. The spinning or throwing which follows is done on a frame with upright spindles and flyers, the yarn as it is twisted being drawn forward through guides and wound on revolving bobbins with a reciprocating motion. From these bobbins the silk is reeled into hanks of definite length for the market. Numerous attempts have been made to simplify the silk-throwing by combining two or more operations on one machine, but not as yet with much success.

Numbering of Silk.—The numbering (*titrage*) of raw and thrown silks, by which the size or fineness of the yarn is stated, is determined by constant length with variable weight, whereas other yarns are indicated by constant weight with variable length.

Conditioning.—Silk in the raw and thrown state, as has already been pointed out, absorbs a large amount of moisture, and may contain from 20 to 30 per cent. of water without being manifestly damp. As it is largely sold by weight it becomes necessary to ascertain its condition in respect of absorbed water, and for that purpose official conditioning houses are established in all the considerable centers of silk trade. In these the silk is tested or conditioned, and a certificate of weight issued in accordance with the results. The silk is for four hours exposed to a dry heat of 230° Fahr., and immediately thereafter weighed. To the weight 11 per cent. is added as the normal proportion of water held by the fiber.

Scouring.—Up to this point the silk fiber continues to be comparatively lusterless, stiff, and harsh, from the coating of albuminous matter (gum or *gres*) on its surface. As a preliminary to most subsequent processes the removal of the whole or some portion of this gum is necessary by boiling-off, scouring, or *decreusage.* To boil off say 300 pounds of thrown silk, about sixty pounds of fine white soap is shreded and dissolved in about 200 gallons of pure water. This solution is maintained at a heat of 195°, and in it the hanks of raw silk are immersed, hung on a wooden rod, the hanks being continually turned round so as to expose all portions equally to the solvent influence of the hot solution. After being dried, the hanks are packed in linen bags and boiled for three hours in a weaker soapy solution, then washed out in pure warm water and dried in a centrifugal hydro-extractor.

Spun Silk Manufacture.—The materials of the spun silk trade are—(1) the floss or loose outer fibers which surround ordinary cocoons; (2) the remains of cocoons after the reelable silk has been removed; (3) waste from throwing processes and from all the stages through which reeled silk passes in manufacturing; (4) unreelable cocoons, *i.e.*, those which are pierced, torn, or cut, stained by dead chrysalides, etc., and double cocoons; (5) cocoons of various wild silks, which are either unreelable or most profitably worked by carding.

Spun silk, as it comes from the spinning frame, shows a good many nibs and irregularities and some roughness of surface. To remove these it is wound from one bobbin to another over an improving or cleaning and gassing machine, which consists of a frame having attached to it a number of small cone rollers, around which the yarn passes in a way which makes the entering portion of the thread rub against the portion running off. In this way, with considerable rubbing, the yarn cleans itself; and in its course over the rollers it rapidly passes through a gas flame, which singes off the fine projecting fibers, leaving the yarn clean, round, and compact. It is submitted to a further examination by eye and hand after being wound into hanks; and some yarns are finally dressed with albumen and gum solutions.

In the combing of waste silk as much as from 25 to 30 per cent. of waste in a second degree arises, much of which is very short, full of nibs and dust. From this a lower quality of yarn is spun, called noil yarn, and on the Continent "bourette" silk, to distinguish it from the "floret" silk made from first waste. On account of the shortness of staple it is worked up by machinery different from that used in the floret manufacture, being prepared by carding, and combed out with a modification of Heilmann's or Lister's combing machines. The finished noil yarn is very lumpy, and requires severe improving and singeing.

Spun silk lacks the smoothness, brilliance, and strength of raw silk yarn, but still it is an extremely valuable and useful material, and its comparative cheapness gives it an important place among the products of textile industry. It is used very largely in mixed fabrics, as well as for the cheaper ribbons, velvets, hat plush, and for many other silk woven fabrics, as also in the hosiery and glove trades and for sewing, knitting, and embroidering yarns.

Silk Weighting.—Into the dyeing of silk it is not here necessary to enter, except in so far as concerns a nefarious practice, carried on in dye-houses, which has exercised a most detrimental influence on the silk trade. Silk, we have seen, loses about one-fourth of its weight in scouring. To obviate that loss it has long been the practice to dye some dark silks "in the gum," the dye combining in these cases with the gum or gelatinous coating, and such silks are known as "souples." Both in the gum and in the boiled-off state silk has the peculiar property of imbibing certain metallic salts largely and combining very firmly with them, the fiber remaining to external appearance undiminished in strength and luster, but much added to in size and weight. Silk in the gum, it is found, absorbs these salts more freely than boiled-off; so to use it for weighting there are these great inducements—a saving of the costly and tedious boiling-off, a saving of the 25 per cent. weight which would have disappeared in boiling, and a surface on which much greater sophistication can be practiced than on scoured silk.

Trade and Commerce.—About the commencement of this century the chief silk-producing regions of the world were the Levant (including Broussa, Syria, and Persia), India, Italy, and France, the two first named sending the low-priced silk, the other two the fine qualities. Between 1840 and 1850, after the opening of trade with China, large quantities of silk were sent from the northern port of Shanghai, and afterward also from the southern port of Canton. The export became important just at the time when disease in Europe had lessened the production on the Continent. This increased production of medium silk, and the growing demand for fine sorts, induced many of the cocoon-growers in the Levant to sell their cocoons to Europeans, who reeled them in Italian fashion under the name of "Patent Brutia," thus producing a very fine, valuable silk. In 1857 commenced the importation of Japan silk, which became so fierce a competitor with Bengal silk as gradually to displace it in favor; and recently the native silk reeled in Bengal has almost ceased to be made, only the best European filatures, produced under the supervision of skilled Europeans, now coming forward.

China and Japan, both of which contribute so largely to the supplies that appear in European and American statistics, only export their excess growth, silk weaving being carried on and native silk worn to an enormous extent in both countries. The other Asiatic exporting countries also maintain native silk manufactures which absorb no inconsiderable proportion of their raw material. The silk production of the world, including only the amount exported from these Oriental countries, amounts on an average to from 20,000,000 pounds to 25,000,000 pounds yearly; but the crop is subject to great variations.

In the manufacture of silken fabrics France occupies the most important position among the nations. Not only is the whole of the raw silk produced in France worked up within the country, but a very considerable proportion of that imported from the Levant and from Asia passes into the hands of the French manufacturers. In all, between 8,000,000 and 9,000,000 pounds of raw silk are, on an average, manufactured into various textures in France. Lyons is the headquarters of the trade, and, if the surrounding regions be included, employment is given to about 120,000 looms—20,000 of which are driven by power—principally in the production of dress silks, plain and figured, and in other heavy silken fabrics, and at St. Étienne and St. Chamond in the ribbon trade. There are also important manufactures of silk at Calais, St. Pierre les Calais (tulles and passementerie), Paris, Nîmes, Tours, Avignon, and Roubaix. Next to France in the extent and value of manufactures comes Germany, where the principal seat of the silk trade is at Crefeld, nearly one-half of the whole production of the empire being manufactured there. The looms of Crefeld and the district it controls numbered in 1881 about 33,000, and the trade was flourishing and expansive. The manufacture of union velvets is the special feature of the industry, about one-half of the looms being devoted to that textile; but Crefeld controls also a large trade in union satins, and pure silk broad goods and ribbons of all kinds. The whole value of its trade amounted in 1881 to almost $20,000,000, one-fourth of which found a market in England, and about a quarter of a million went to France. The other principal centers of the silk trade, all in Rhenish Prussia, are Viersen, Barmen, Elberfeld, and Mühlheim. Third on the list of Continental producers is Switzerland, where Zurich takes the lead with broad goods (failles, armures, satins, serges, etc.), and Basel rivals St. Étienne in the ribbon trade. The number of looms throughout the country is estimated at 40,000, of which 4,000 are power-looms. Italy—the early home of the silk trade, the land of the gorgeous velvets of

Genoa and the damasks and brocades of mediæval Sicily, Venice, and Florence—has fallen from its high estate, and now employs not more than 30,000 looms, the center of greatest activity being at Como; but Genoa still makes velvets, and the brocades of Venice are not a thing of the past. In Austria the silk trade has found its principal development in Vienna and its immediate neighborhood, the number of looms throughout the entire empire being estimated at from 15,000 to 20,000, of which 2,000 are power-looms. In Russia there is, with a growing cultivation of raw silk, a considerable and increasing manufacture, the special feature of which is the weaving at Moscow of gold and silver tissues and brocades for sacerdotal use, and for traffic with Central Asia.

In the United Kingdom all the silk industries—these depending on spun silk alone excepted—have been in a depressed and declining condition ever since 1860. The principal silk manufacturing towns of England have been Coventry, Macclesfield, Congleton, Leek, Derby, London (Spitalfields), Manchester, Middleton, and Nottingham.

SILLIMAN, Benjamin, American chemist and geologist, was born in 1779 at Trumbull (then called North Stratford), Conn. Silliman received his early education at Fairfield, Conn., at that time the residence of his father's family, and in 1792 he entered Yale College, where he graduated in 1796. In 1813 he began service with the medical department of Yale College as professor of chemistry and pharmacy, and continued to give instruction there for many years. In 1818 he founded the *American Journal of Science and Arts*, a periodical devoted to the physical sciences, which has been, and is, the most important American scientific serial. In 1853 he became professor *emeritus*, but he continued to lecture for a year or two longer. His closing years were quietly spent in unabated mental activity at New Haven until his death in 1864.

SILLIMAN, Benjamin, American chemist and physicist, son of the preceding, was born in 1816 at New Haven, Conn., and educated at Yale College, where he graduated in 1837. He then became assistant to his father in chemistry, mineralogy, and geology, working in his laboratory at the college, and pursuing original investigations. He began teaching in the laboratory soon afterward. The school thus informally established was shortly afterward recognized by a formal act of the corporation of the college, and ultimately developed into the Sheffield Scientific School of Yale College. In 1838 he became associate editor with his father of the *American Journal of Science and Arts*, and he continued in the editorship of the journal until the close of his life. In 1854 he succeeded his father as professor of chemistry, and continued to give instruction in this science, first in the academical and afterward in the medical department of Yale College, until his death in 1885.

SILO. A modern silo is a pit or erection in which green crops are preserved in an undried condition for fodder. The term is derived from the Greek σιρός (Lat., *sirus*), a pit for holding grain. It is only of recent years that *ensilage*, *i.e.*, the preservation of green food for cattle by partial fermentation in silos, has become an important feature in agricultural economy.

A silo should have a depth of at least fifteen feet, and may be either a pit or a building above ground, provided it is water-tight, and, as far as possible, air-tight. The crops suitable for ensilage are the ordinary grasses, clovers, lucerne, vetches, oats, rye, and maize; but various weeds may also be stored in silos with good results, notably spurrey (*Spergula arvensis*), a most troublesome plant in poor light soils. As a rule the crop should be mown when in full flower, and deposited in the silo on the day of its cutting. Fair dry weather is not essential; but it is found that when moisture, natural and extraneous, exceeds 75 per cent. of the whole, good results are not obtained. The material is spread in uniform layers over the floor of the silo, and closely packed and trodden down. If possible, not more than a foot or thereabout should be added daily, so as to allow the mass to settle down closely, and to heat uniformly throughout. When the silo is quite filled a layer of straw or some other dry porous substance is spread over the surface, then it is covered with boards, and a pressure of not less than 100 pounds per square foot is applied by weighting or other mechanical means.

SILURIDÆ, a large family of freshwater Fishes, flourishing in the present epoch, and represented by a great variety of forms in all the tropical and temperate regions, many of them reaching back into the Tertiary age.

The modifications of the vertical fins, or rather the specialization of certain portions at the expense of others, and the greater or less extent of the branchial aperture form excellent characteristics for subdividing the Siluroids.

I. In the *Siluridæ Homalopteræ* the vertical fins are exceedingly long, occupying nearly the whole extent of the embryonal fin, and in one genus (*Heterobranchus*) a great part of the dorsal portion retains its embryonic character, being a rayless adipose fin. All the Siluroids of this section belong to the fauna of the Old World and Australia.

II. In the *Siluridæ Heteropteræ* the dorsal fin has almost or entirely disappeared; only its foremost portion and a small adipose remnant may be preserved; on the other hand the anal portion is retained in its whole extent. The gill-membranes remain separate and overlap the isthmus. This section likewise belongs to the fauna of the Old World.

III. The *Siluridæ Anomalopteræ* are a small section from tropical America, in which the dorsal and adipose fins are very short and belong to the caudal vertebral column, while the anal is very long, and the gill-membranes are entirely separate, overlapping the isthmus.

IV. The *Siluridæ Proteropteræ* are a section extremely numerous in species, and represented throughout the tropics. The dorsal fin consists of a short-rayed and an adipose portion, the former belonging to the abdominal vertebral column; the anal is always much shorter than the tail. The gill-membranes are not confluent with the skin of the isthmus; they have a free posterior margin. When a nasal barbel is present, it belongs to the posterior nostril. This section includes among many others the genus *Bagrus*, of which the "Bayad" (*B. bayad*) and "Docmac" (*B. docmac*) frequently come under the notice of travelers on the Nile; they grow to a length of five feet and are eaten. Of the "Cat-Fishes" of North America (*Amiurus*), locally called "bull-heads" or "horned-pouts," with eight barbels, some twenty species are known.

V. In the *Siluridæ Stenobranchiæ* the dorsal fin consists of an adipose portion and a short-rayed fin which belongs to the abdominal vertebral column, and, like the adipose fin, may be sometimes absent. The gill-membranes are confluent with the skin of the isthmus. The Siluroids belonging to this section are either South American or African.

VI. The section of *Siluridæ Proteropodes* contains small forms some of which are of interest by the degree of specialization to which they have attained in one or the other direction. Many of them are completely mailed; but all have in common a short-rayed dorsal fin, with the ventrals below or rarely in front of it.

Their gill-openings are reduced to a short slit; their pectorals and ventrals have assumed a horizontal position; and their vent is before, or not much behind, the middle of the length of the body.

VII. The small section of *Siluridæ Opisthopteræ* comprises South-American forms, the majority of which inhabit waters at high altitudes up to 14,000 feet above the level of the sea. All have a short-rayed dorsal fin, placed above or behind the middle of the length of the body above or behind the ventrals, which may be absent. Also the anal is short. The nostrils are remote from each other, and the gill-membranes are not confluent with the skin of the isthmus.

VIII. Finally the *Siluridæ Branchicolæ* comprise the smallest and least developed members of the family; they are referred to two genera only from South America, *Stegophilus* and *Vandellia*, the smallest of which does not exceed the length of two inches. Their body is soft, narrow, cylindrical, and elongate; the dorsal and anal fins short; the vent far behind the middle of the length of the body; gill-membranes confluent with the skin of the isthmus. Each maxillary is provided with a small barbel; and the gill-covers are armed with short stiff spines.

SILVANUS, an ancient Italian god of the woods (*silvæ*), closely allied to Faunus. Virgil speaks of him as a god of fields and cattle, and says that the Pelasgians dedicated a grove to him near Cære. Horace calls him the god of boundaries. Pigs were sacrificed to him, and at harvest festivals he received offerings of milk.

SILVER is widely diffused throughout the earth's crust, including the ocean, which contains a trace of the noble metal—minute, it is true, in a relative sense, but in absolute amount approaching 10,000 million tons. Of the varieties of silver ores, the following chiefly are metallurgically important:—(1) *Reguline Silver*, generally alloyed with mercury or gold, and if with the latter including sometimes a trace of platinum; (2) *Horn Silver*, native chloride, $AgCl$; (3) *Silver Glance*, native sulphide, Ag_2S; (4) *Silver-Copper Glance*, $(Ag,Cu)_2S$; (5) *Pyrargyrite* (" Rothgültigerz"), Ag_3SbS_3; (6) *Stephanite*, Ag_5SbS_4; (7) *Polybasite*, $9(Ag_2,Cu_2)S + (Sb_2,As_2)S_3$. Silver is also frequently met with in base-metallic ores, *e.g.*, in lead ores and many kinds of pyrites. Unmixed silver minerals nowhere present themselves in large continuous masses. What we call "silver ores" are all more or less complex mixtures in which the non-argentiferous components are usually decidedly in the majority. Their metallurgic treatment depends chiefly on the nature of these admixtures, the state of combination of the silver being as a rule irrelevant in the choice of a process, because some at least of the noble metal is always present as sulphide, and our modes of treatment for it include all other native forms.

Chemically Pure Silver.—Even the best "fine" silver of commerce contains a few thousandth-parts of copper or other base metal. To produce perfectly pure metal the most popular method is to first prepare pure chloride to a nitric solution of any kind of ordinary "silver," and then to reduce the chloride to metal, which can be done in a great variety of ways. One way is to mix the dry chloride intimately with one-fifth of its weight of pure quicklime or one-third of its weight of dry carbonate of soda, and to fuse down the mixture in a fire-clay crucible at a bright red heat.

Pure silver (ingot) has a beautiful white color and luster; it is almost as plastic as pure gold, and, like it, very soft. It does not tarnish in natural air; but in air contaminated with ever so little sulphuretted hydrogen it gradually draws a black film of sulphide. The specific gravity of the frozen metal is 10.42 to 10.51, rising to 10.57 after compression under a die. It is the best conductor of heat and electricity. The expansion of unit length from 0° to 100° C. is 0.001936 (Fizeau). The specific heat is 0.0570 (Regnault), 0.0559 (Bunsen). It fuses at 954° C. (Violle)—*i.e.*, far below the fusing point of copper or gold—without oxidation, unless it be in contact with a surface of silicate (porcelain glaze, etc.), when a trace of silicate of Ag_2O is produced. It volatilizes appreciably at a full red heat; in the oxyhydrogen flame it boils, with formation of a blue vapor. Water, and ordinary non-oxidizing aqueous acids generally, do not attack silver in the least, hydrochloric acid excepted —which, in the presence of air, dissolves the metal very slowly as chloride. A solution of common salt acts simmilarly, the liberated sodium becoming $NaOH$. Aqueous hydriodic acid, even in the absence of air, dissolves silver perceptibly, with evolution of hydrogen (Deville). Aqueous nitric acid dissolves the metal readily as nitrate; hot vitriol converts it into a magma of crystalline sulphate, with evolution of sulphurous acid. Silver is absolutely proof against the action of caustic alkali leys, and almost so against that of fused caustic alkalies even in the presence of air. It ranks in this respect next to gold, and is much used to make vessels for chemical operations involving the use of fused caustic potash or soda. The ordinary "fine" metal is good enough for this purpose.

Silver Alloys.—Pure silver is too soft to make durable coins or vessels combining lightness with stability of form. This defect can be cured by alloying it with a little copper. All ordinary "silver" articles consist of such alloys. The proportion of silver in these (their "fineness") is habitually stated in parts of real silver per 1,000 parts of alloy. In Great Britain all silver coins are made of "standard silver," the fineness of which, by legal definition, is 925. The toleration is 4 units (of pure silver in 1,000 of alloy), *i.e.*, a specimen passes as long as its fineness lies between 925 and 921. As regards silver-plate the "Hall" in London refuses to stamp any poorer alloy. In Germany and in the United States all silver coins, in France and Austria the major silver coins, are of the fineness 900, with a toleration of 3 units. The minor coins of Austria are of the fineness 375 to 520; in France all silver coins under one franc contain 835 of silver, 93 of copper, and 72 of zinc in 1,000 parts. The fineness prescribed by law or custom for "silver" articles is 950 or 800 in France, 750 in North Germany, 812.5 in South Germany, and 820 in Austria. All *these* alloys at least are liable to "liquation," which means that, although they are perfectly homogeneous in the crucible, they freeze into layers of not absolutely the same composition.

Mode of Occurrence.—Silver is rarely found in the native state, and then only in comparatively small quantities. Most of the ores of silver are difficult to reduce, and it is therefore deemed safe to regard this as the last of the three great coining metals which came into use. Silver is originally as widespread as gold, occurring in nearly all the volcanic rocks and some of the Primary ones. In the Silver Reef district of Utah it is found in sedimentary sandstone, though this appears to have undergone some change from volcanic action. But gold remains unaltered by the action of the elements, and is often carried away long distances from its original place of occurrence by the breaking down of the rocks which contain it and their formation anew elsewhere, either as other rocks or as "placers" of gravel or sand, containing gold easily washed out by hand or with rude appliances. Silver, on the contrary, is only to be found in the rocks where it originally occurs. When these are broken down or worn away, the silver is either driven into new mineral combinations, or, more commonly, dissipated and lost. Hence silver is only to be obtained by subterranean mining, and demands the aid of capital and associated labor. The greater rapidity with which gold can be obtained has often influenced the legal relation of value between these two metals, and its bearing upon prices, commerce, and civilization.

Cost of Production.—In nearly all silver ores there is some gold, and in nearly all gold ores some silver. In the $350,000,000 worth of metal produced from the Comstock lode of Nevada nearly one-half in value consisted of gold. For this and other reasons, it is impossible to determine the general average cost of producing gold and silver from all the mines during any reasonably long period of time. If recent statistics are to be trusted, both metals are produced on the average at a loss. Such is alleged to have been the case in California, Australia, and Nevada, countries whose combined product has equaled in value nearly $3,000,000,000.

The closure of the mints of most important commercial countries to silver, while they have remained open to the free coinage of gold at a fixed valuation, has enhanced the purchasing power of gold, compared with either silver or other commodities, about one-fourth. The price of uncoined silver being usually quoted in gold, this phenomenon appears as a "fall of silver," by which term it is commonly known. This alleged fall, its causes, consequences, and remedies, constitute the "Silver Question."

Production.—In the principal producing countries—the United States, Mexico, Chili, and Peru—mining is free; and there are no official returns of the production, which is therefore mere matter of conjecture. In the United States it is the custom to value silver bullion at one-sixteenth that of gold. This unduly swells the value of the conjectural product of that country more than one-fourth. From a careful consideration of the bullion movement, the total annual product of silver throughout the world at the present time is estimated at between 50,000,000 and 60,000,000 ounces, at which figure it has remained steady upward of ten years.

Consumption in the Arts.—Direct inquiries as to the quantity of silver used in the arts have met with little success, and the statistics so obtained are defective. But the total production of silver in the Western World, from the discovery of America to the present time, has been, in value, about $7,000,000,000, of which about $1,500,000,000 remain in coins. Consequently $5,500,000,000, or nearly four-fifths, have been consumed in the arts, lost, etc., or exported to Asia. There are estimated to be about $250,000,000 or $300,000,000 worth of silver coins in India, and some trifling amounts each in China, Japan, Persia, etc. On the whole it appears quite safe to estimate the average annual consumption of silver in the arts and through wear, tear, and loss as fully equal to three-fourths of the production. Silver is principally used for plate and jewelry; it is also consumed in photography, and in numerous chemical preparations, such as lunar caustic, indelible ink, hair dyes, fulminating powder, etc.

SILVERIUS, the successor of Pope Agapetus I., was a legitimate son of Pope Hormisdos, born before his father entered the priesthood. He was consecrated on June 8, 536, having purchased his elevation to the see of St. Peter from the Gothic king Theodotus. He opposed the restoration of the patriarch Anthimus, whom Agapetus had deposed, and thus brought upon himself the hatred of Theodora, who desired to see Vigilius made pope. He was deposed accordingly by Belisarius in March, 537.

SILVESTER I., bishop of Rome from January, 314, to December, 335, succeeded Melchiades and was followed by Marcus. The accounts of his papacy preserved in the *Liber Pontificalis* (seventh or eighth century) and in Anastasius are little else than a record of the gifts said to have been conferred on the Roman Church by Constantine the Great.

SILVESTER II., pope from 999 till 1003, and previously famous under his Christian name of Gerbert, first as a teacher and afterward as archbishop successively of Rheims and Ravenna, was an Aquitanian by birth, and was educated from his boyhood at the abbey of St. Gerold in Aurillac. Gerbert was elected to succeed the deposed bishop of Rheims in 991.

Meanwhile the friends of Arnulf appealed to Rome, and a papal legate was sent to investigate the question. As yet Hugh Capet maintained the cause of his nominee and forbade the prelates of his kingdom to be present at the council of Mouzon, near Sedan (June 2, 995). Notwithstanding this prohibition Gerbert appeared in his own behalf. The events of the next few years are somewhat obscure. Council seems to have followed council, but with uncertain results. At last Hugh Capet died in 996, and, shortly after, his son, Robert, married Bertha, the widow of Odo, count of Blois. The pope condemned this marriage as adulterous; and Abbo of Fleury, who visited Rome shortly after Gregory V.'s accession, is said to have procured the restoration of Arnulf at the new pontiff's demand. We may surmise that Gerbert left France toward the end of 995, as he was present at Otto III.'s coronation, May 21, 996. Somewhat later he became Otto's instructor in arithmetic, and had been appointed archbishop of Ravenna before May, 998. Early in the next year he was elected pope (April, 999), and took the title of Silvester II. In this capacity Gerbert showed the same energy that had characterized his former life. He is generally credited with having fostered the splendid vision of a restored empire that now began to fill the imagination of the young emperor, who is said to have confirmed the papal claims to eight counties in the Ancona march. Writing in the name of the desolate church at Jerusalem he called upon the warriors of Christendom to arm themselves in defense of the Holy City, once "the light of the world," but now fallen so low. Thus he sounds the first trumpet-call of the crusades, though almost a century was to pass away before his note was repeated by Peter the Hermit and Urban II.

Nor did Silvester II. confine himself to plans on a large scale. He is also found confirming his old rival Arnulf in the see of Rheims; summoning Adalbero or Azelmus of Laon to Rome to answer for his crimes; judging between the archbishop of Mainz and the bishop of Hildesheim; besieging the revolted town of Cesena; flinging the count of Angoulême into prison for an offense against a bishop; confirming the privileges of Fulda abbey; granting charters to bishoprics far away on the Spanish mark; and, on the eastern borders of the empire, erecting Prague as the seat of an archbishopric for the Slavs. More remarkable than all his other acts is his letter to St. Stephen, king of Hungary, to whom he sent a golden crown, and whose kingdom he accepted as a fief of the Holy See. It must, however, be remarked that the genuineness of this letter, in which Gerbert to some extent foreshadows the temporal claims of Hildebrand and Innocent III., has been hotly contested, and that the original document has long been lost. All Gerbert's dreams for the advancement of church and empire were cut short by the death of Otto III., February 4, 1002; and this event was followed a year later by the death of the pope himself, which took place May 12, 1003. His body was buried in the church of St. John Lateran, where his tomb and inscription are yet to be seen.

SILVESTER III. When Boniface IX. was driven from Rome early in January, 1044, John, bishop of Sabina, was elected in his stead and took the title of Silvester III. Within three months Boniface returned and expelled his rival. Nearly three years later (December, 1046), the council of Sutri deprived him of his bishopric and priesthood. He was then sent to a monastery, where he seems to have died.

SIMANCAS, a walled town of Spain, 8½ miles southwest from Valladolid, on the road to Zamora, is situated on the Pisuerga, here crossed by a fine bridge of seventeen arches. The population within the municipal boundaries was 1,258 in 1885.

SIMBIRSK, a government of eastern Russia, on the right bank of the middle Volga, with Kazañ on the north, Samara on the east, Saratoff on the south, and Penza and Nijni-Novgorod on the west, has an area of 19,110 square miles, and a population (1882) of 1,471,164. Agriculture, favored by a fertile soil, is the chief occupation, grain being exported or manufactured into spirit. Linseed and hempseed are cultivated for exportation, as also kitchen-garden produce and some fruit. Bee-keeping is a favorite and remunerative occupation with Mordvinians, and fishing (sturgeon) is carried on in the Volga and the Sura. The timber-trade in the north and the shipbuilding on the Sura are considerable sources of wealth; wooden sledges and wheels are made and exported, as well as bags of lime-tree bast, the last-named industry giving occupation to whole villages. Other petty trades, also carried on in conjunction with agriculture, are the manufacture of felts and felt hats, linen stuffs (especially among the Mordvinians), cottons, boots, and small metal wares. A characteristic feature of Simbirsk is the trade in wooden vessels, which are exported to Vyatka, Perm, Orenburg, Samara, and the Don, and there exchanged for cat, squirrel, and hare skins. Flour-mills are numerous. Watered by the Volga and the Sura, and moreover traversed in its southern portion by the railway connecting Orenburg and Samara with Penza and Ryazañ, by Batraki and Syzrañ, the government has an active trade. Its exports, however, are much below those of Samara and Saratoff. Batraki and Syzrañ are important centers of traffic, the aggregate amount of merchandise entered and cleared by rail and boat being respectively 2,435,000 and 2,000,000 hundredweights (timber not included). The chief ports of lading on the Sura are Alatyr, Promzino-Gorodische, and Berezniki, each with exports valued at about 750,000 rubles, or about $600,000. Corn, linseed, woolen stuffs, timber, potash, and wooden wares are the principal articles of trade.

SIMBIRSK, capital of the above government, is situated 576 miles east-southeast of Moscow, between the Volga and the Sviyaga, here separated by an isthmus only two miles broad. The population (24,600 in 1867) was 36,600 in 1880.

SIMEON (שִׁמְעוֹן), second son of Jacob by Leah (Gen. xxix. 33). The tribe of Simeon, like that of Levi, was broken up at a very early period, under circumstances of which we have some indication in Gen. xxxiv. and xlix. In Judges i. the Simeonites appear as sharing the conquests of Judah in the extreme south of Canaan, but there is no mention of them in this region in 1 Sam. xxx., and the tribe is not named at all in the blessing of Moses. It reappears, however, in 1 Chron. iv. 24-43 (*cf.* xii. 25), and is reckoned to the kingdom of Ephraim (2 Chron. xv. 9; xxxiv. 6).

SIMEON OF DURHAM. See SYMEON.

SIMEON STYLITES. See MONACHISM.

SIMFEROPOL, the capital of the Russian government of Taurida, is situated in the southwestern part of the Crimea, on the Salghir (which frequently becomes dry), 900 miles from Moscow. The population was 16,550 in 1866 and 29,030 in 1881.

SIMLA, a small district in the lieutenant governorship of the Punjab, India, situated among the hills of the lower Himalayan system in 31° 6′ N. latitude and 77° 11′ E. longitude. The population of the district in 1881 was 42,945. Cultivation is widely carried on in all the lower valleys of the hills, and the fields are sown with maize, pulses, or millet for the autumn and with wheat for the spring harvest. Poppy, hemp, turmeric, ginger, and potatoes form the principal staples raised for exportation to the plains. The trade of the district centers mainly in the bazaars of Simla, which forms a considerable entrepôt for the produce of the hills. Another important trade-center is the town of Rampur, on the Sutlej, from which the great part of the shawl-wool (*pashm*) finds its way for exportation to British India.

SIMLA, the administrative headquarters of the above district, and the summer capital of India, stands at an elevation of 7,084 feet above sea level. Since the administration of Sir John Lawrence (1864) it has been the resort, during the hot weather, of the successive governors-general of India, with their secretaries and headquarters establishments. In 1881 it had a population of 13,258.

SIMMS, WILLIAM GILMORE, an American poet, novelist, and historian, was born at Charleston, S. C., April 17, 1806, of Scoto-Irish descent. At the age of eight he wrote verses, and in his nineteenth year he produced a *Monody on Gen. Charles Coteswort Pinckney.* Two years later, in 1827, *Lyrical and Other Poems* and *Early Lays* appeared; and in 1828 he began journalism, editing with conspicuous ability and partly owning the *City Gazette*—a paper opposed to the doctrine of nullification. The enterprise failed, and the editor devoted his attention entirely to letters, and in rapid succession published *The Vision of Cortes, Cain, and Other Poems* (1829), *The Tricolor, or Three Days of Blood in Paris* (1830), and his strongest poem, *Atalantis*, a story of the sea (1832). *Atalantis* established his fame as an author, and *Martin Faber*, the story of a criminal, his first tale, written in the following year, was warmly received. From this time forward his writings became very abundant. Though sensational and full of excessive coloring, they are held in good repute in the Southern States. During the Civil war Simms espoused the side of the Secessionists in a weekly newspaper, and suffered damage at the hands of the Federal troops when they entered Charleston. He held a seat in the State legislature for some years; and the university of Alabama conferred on him the degree of LL.D. He died at Charleston on June 11, 1870.

SIMON MAGUS. In the extant documents of the first three centuries we meet with Simon Magus in a threefold aspect: (1) as Samaritan Messiah attempting by the aid of Christianity to establish a new religion; (2) as founder of a school of Gnostics and as father of heresy; (3) as a caricature of the apostle Paul. The Tübingen critics (Baur, Volkmar, Zeller, Lipsius, and, until the year 1878, Hilgenfeld also) have tried to show that the oldest accounts are those in which Simon is represented in the last-named aspect; they have accordingly denied his existence, maintaining that all the features attributed to him in the oldest sources are accounted for by the life and personality of Paul. In particular they would explain Simon's visit to Rome by the apostle's journey thither, and further would have it that the church tradition of Peter's having gone to Rome arose solely out of the supposition that the great apostle who had withstood the Paul-Simon everywhere else must have followed up his victory in the capital of the world also.

The oldest account of Simon Magus occurs in the Acts of the Apostles. When Philip the evangelist came to Samaria, about 37 A.D., he found a great religious movement going on. One named Simon had given himself out for some great person, and by dint of his extraordinary works had stirred up and gained over the whole population, who took him for the exalted manifestation of the Divine Power itself. Philip converted the majority of Simon's adherents; and Simon himself, amazed at the deeds wrought by Philip, received baptism, and joined the evangelist's society. Peter and John then came to Samaria to impart to the baptized the Holy Ghost by the laying on of hands; and Simon offered the apostles money to invest him with a like power of conferring the gift. But Peter sternly rebuked him, exhorting him to repent and beseech God that the evil thought of his heart might be forgiven him. Simon thereupon begged the apostles to pray on his behalf.

The conception of Simon as the father of heresy within the church is in no way suggested in the Acts; nor has Justin in the writings which we possess given any hint of a reason why Simon should be viewed in such a light. But the testimony of the Acts that Simon received baptism, and for a while joined himself to the Christians, enables us at least in some degree to understand how he afterward got the reputation alluded to.

Justin has a good deal more about Simon that is not to be found in Acts:—(1) he gives his birthplace as Gittha in Samaria; (2) he states that Simon came to Rome in the reign of Claudius, and there by his magical arts gained some followers, and was taken for a god, and that a statue was erected to him on the Tiber Island with the inscription SIMONI DEO SANCTO; and (3) he states that the adherents of Simon passed off a woman named Helena, whom he brought to Rome with him, and who had previously been a prostitute in Tyre, as the "first idea" (πρώτη ἔννοια) of Simon.

We may regard this account, which, according to Irenæus, is partly based upon direct statements of the Simonians themselves, as essentially derived from the *Syntagma* of Justin. That we have here before us, not the genuine teaching of Simon, but the gnosis of the Simonians, is very evident; this gnosis, however, is just as much bound up with the person of Simon as is the Christian gnosis with the person of Jesus Christ. Simon is the manifested Deity Himself; but—and herein lies the Christian, or more properly the anti-Christian element—Simon is at the same time represented as Christ, *i.e.*, is identified with Christ. The fusing together of Simon and Christ, a syncretistic-gnostic conception of the world and its creation, and an ethical antinomianism are the distinctive features of this new universal religion. That we have here an attempt to found a new religion, and that a world-religion, upon the principle of embodying all important articles of the older ones, appears also from the fact that Simon is identified not only with Christ but also with Zeus, and that Greek legends and mythologies are utilized for the system. We have therefore in Simonianism a rival system to Christianity, in which the same advantages are offered, and in which accordingly Christian elements are embodied, even Christ Himself being identified with the Supreme God (Simon). The attempt to establish such a system in that time of religious syncretism has nothing incredible about it; and in view of the religious conditions then prevailing in the locality it can easily be understood that it proceeded from a Samaritan. The basis of it was laid by Simon himself, who claimed to be a god and yet derived something from the Christian missionaries; but the development was due to his followers in the second century, who may have borne to the original Simonians exactly the same relation as did the Valentinians to the first Christians.

SIMON, ABRAHAM, medalist and modeler, was born in Yorkshire, England, in 1622. During the Commonwealth he executed many medals of leading Parliamentarians, and at the Restoration he was patronized by Charles II. Having incurred the displeasure of the duke of York, he lost the favor of the court, and died in obscurity in 1692.

SIMON, RICHARD, the "father of Biblical criticism," was born at Dieppe, France, on May 13, 1638. His early studies were carried on at the college of the Fathers of the Oratory in that city. His first essay in authorship was the publication of a work entitled *Fides Ecclesiæ Orientalis, seu Gabrielis Metropolitæ Philadelphiensis Opuscula, cum interpretatione Latina, cum notis*, the object of which was to demonstrate that the belief of the Greek Church regarding the Eucharist was the same as that of the Church of Rome. His most famous work was the *Critical History* which appeared, with Simon's name on the title page, in the year 1685, from the press of Reenier Leers in Rotterdam. An imperfect edition had previously been published at Amsterdam by Daniel Elzevir, based upon a MS. transcription of one of the copies of the original work which had escaped destruction and had been sent to England, and from which a Latin and an English translation were afterward made.

Simon is described as a man of middle stature, with somewhat unprepossessing features. His temper was sharp and keen, and as a controversialist he displayed a bitterness of tone and an acerbity of expression which tended only to aggravate the unpleasantness of controversy. He was entirely a man of intellect, free from all tendency to sentimentality, and with a strong vein of sarcasm and satire in his disposition. His reading was immense, and his memory powerful and retentive. He is said to have usually prosecuted his studies lying on the floor of his apartment, on a pile of carpets or cushions. Few men have written more that is worth reading on Biblical subjects than he, considering the hardships and vicissitudes of his chequered life. He died at his native city of Dieppe on April 11, 1712, at the age of seventy-four.

SIMON, THOMAS, medalist, was born, according to Vertue, in Yorkshire, England, about 1623. He produced several fine portrait medals of Cromwell, one of which is copied from a miniature by Cooper. After the Restoration he was appointed engraver of the king's seals. On the occasion of his contest with the brothers Roettiers, who were employed by the mint in 1662, Simon produced his celebrated crown of Charles II., on the margin of which he engraved a petition to the king, setting forth the excellence of his own productions and praying for redress. This is usually considered his masterpiece. An impression of the coin fetched $1,100 at an auction in 1832. This admirable medalist is believed to have died of the plague in London in 1665.

SIMONIDES (or SEMONIDES, as some write the name) OF AMORGOS stands midway in both time and reputation between the other two iambic poets of Greece—Archilochus and Hipponax. A native of Samos, he led a colony to the island of Amorgos in the Archipelago, and lived there about 660 B. C., in Minoa, a town of his own founding. Besides two books of iambics, we are told that he wrote elegies, and a poem on the early history of the Samians, but only one insig nificant elegy has been with any degree of plausibility attributed to him. We possess about thirty fragments of his iambic poems, written in clear and vigorous Ionic, with much force and no little harmony of versification.

SIMONIDES of Ceos, one of the greatest poets and most accomplished men of antiquity, was born at Iulis in the island of Ceos, 556 B.C. Pindar alone among his contemporaries seems to have depreciated Simonides, perhaps not without a touch of jealousy; by all the rest he was revered. He lived for the most part with his friends, whose praises he had sung for money; we hear of him at the court of Hipparchus in Athens, with the Scopedæ in Thessaly, and finally at the court of Hiero of Syracuse, where he died in 469 B. C.

SIMONY is an offense against the law of the church. The name is taken from Simon Magus. In the canon law the word bears a more extended meaning than in English law. "Simony according to the canonists," says Ayliffe in his *Parergon*, "is defined to be a deliberate act or a premeditated will and desire of selling such things as are spiritual, or of anything annexed unto spirituals, by giving something of a temporal nature for the purchase thereof; or in other terms it is defined to be a commutation of a thing spiritual or annexed unto spirituals by giving something that is temporal." An example of the offense occurs as early as the third century in the purchase of the bishopric of Carthage by a wealthy matron for her servant, if the note to Gibbon is to be believed. The offense was prohibited by many councils, both in the East and in the West, from the fourth century onward.

For the purposes of English law simony is defined by Blackstone as the corrupt presentation of any person to an ecclesiastical benefice for money, gift, or reward. The offense is one of purely ecclesiastical cognizance, and not punishable by the criminal law. The penalty is forfeiture by the offender of any advantage from the simoniacal transaction, of his patronage by the patron, of his benefice by the presentee. An innocent clerk is under no disability, as he might be by the canon law.

SIMPLICIUS, the successor of Pope Hilarius or Hilarus, was a native of Tibur, and was consecrated bishop of Rome on February 25, 468. He died March 2, 483, and was succeeded by Felix III.

SIMPLICIUS, a native of Cilicia, a disciple of Ammonius and of Damascius, was one of the last of the Neoplatonists. In his writings Simplicius, who had small pretensions to originality of doctrine, devotes himself to the exposition and reconciliation of his authorities. His respect at once for Plato and for Aristotle is so great that he refuses to acknowledge any real difference between them, even in regard to their theories of universals and of matter. His remarks are, however, thoughtful and intelligent, and his learning is prodigious. To the student of Greek philosophy his commentaries are invaluable, as they contain many fragments of the older philosophers as well as of his immediate predecessors.

SIMPSON, Sir James Young, Bart., physician, was born in the town of Bathgate, Linlithgow, Scotland, on June 7, 1811. At the age of fourteen he entered the university of Edinburgh as a student in the arts classes. Two years later he began his medical studies. At the age of nineteen he obtained the license of the College of Surgeons, and two years afterward took the degree of doctor of medicine. Doctor Thomson, who then occupied the chair of pathology in the university, impressed with the graduation thesis, "On Death from Inflammation," presented by Simpson, offered him his assistantship. The offer was accepted, and during the session 1837-38 he acted as interim lecturer on pathology during the illness of the professor. The following winter he delivered his first course of lectures on obstetric medicine in the extra academical school. On February 4, 1840, he was elected to the professorship of medicine and midwifery in the university. In 1847 he was appointed a physician to the queen in Scotland. In 1859 he advocated the use of acupressure in place of ligatures for arresting bleeding; his views on this subject have, however, given place to improvements in the ligature and to a better knowledge of the conditions influencing its efficiency. His contributions to the literature of his profession and to archæology, in which latter he took an active interest, were very numerous, and embrace *Obstetric Memoirs and Contributions* (2 vols.), *Homœopathy*, *Acupressure*, *Selected Obstetrical Works*, *Anæsthesia and Hospitalism*, *Clinical Lectures on the Diseases of Women*, and three volumes of essays on archæological subjects. Simpson, who had been created a baronet in 1866, died on May 6, 1870, and was accorded a public funeral; his statue in bronze now stands in West Princes Street Gardens, Edinburgh.

SIMPSON, Thomas, mathematician, was born at Market Bosworth in Leicestershire, England, August 20, 1710. He was enabled to publish by subscription his *Treatise of Fluxions* in 1737. His treatise, as was afterward acknowledged, abounded with errors of the press, and contained several obscurities and defects incidental to the author's want of experience and the disadvantages under which he labored. His next publications were *A Treatise on the Nature and Laws of Chance*, 1740; *Essays on Several Curious and Useful Subjects in Speculative and Mixed Mathematicks*, 1740; *The Doctrine of Annuities and Reversions deduced from General and Evident Principles*, 1742; and *Mathematical Dissertations on a Variety of Physical and Analytical Subjects*, 1743. Soon after the publication of his *Essays* he was chosen a member of the Royal Academy at Stockholm; in 1743 he was appointed professor of mathematics in the Royal Military Academy at Woolwich; and in 1745 he was admitted a fellow of the Royal Society of London. In 1745 he published *A Treatise of Algebra*, with an appendix containing the construction of geometrical problems, and in 1747 the *Elements of Plane Geometry*. In 1752 appeared *Select Exercises for Young Proficients in the Mathematicks*, and in 1757 his *Miscellaneous Tracts on Some Curious and Very Interesting Subjects in Mechanics, Physical Astronomy, and Speculative Mathematics*, the last and perhaps the greatest of all his works. His unremitting application and the want of proper regimen gradually undermined his health, and he died on May 14, 1761, at his native village. His name will probably be considered the most illustrious in the long roll of the non-academical mathematicians of Britain.

SIMROCK, Karl, German poet and student of mediæval literature, was born on August 28, 1802, at Bonn. He died on July 18, 1876.

SIMSON, Robert, Scotch mathematician, was the eldest son of a Glasgow merchant, John Simson of Kirktonhill in Ayrshire, and was born on October 14, 1687. His death took place on October 1, 1768.

SIMSON, William, Scotch portrait, landscape, and subject painter, was born at Dundee in 1800. He died in London on August 29, 1847.

SINAI. In judging of the points of controversy connected with Sinai we are brought face to face with the question of the historicity of the Hebrew records involved. Though new attempts to fix the stations of the wilderness wandering appear every year, critics have long agreed that the number of forty for the years of wandering and for the stations are round numbers, and that the details are not based on historical tradition of the Mosaic age. This does not exclude the possibility that the names of some or all of the stations belong to real places and are based on more ar less careful research on the part of the writers who record them. As regards the Mountain of the Law in particular, if the record of Exod. xix. *seq.* is strictly historical, we must seek a locality where 600,000 fighting men, or some 2,000,000 souls in all, could encamp and remain for some time, finding pasture and drink for their cattle, and where there was a mountain (with a wilderness at its foot) rising so sharply that its base could be fenced in, while yet it was easily ascended, and its summit could be seen by a great multitude below.

There is no genuine pre-Christian tradition on this subject. The chief authority for the ancient sanctity of Mount Sinai is Antoninus Martyr (end of the sixth century), who tells that the heathen Arabs in his time still celebrated a moon feast there.

In early Christian times many anchorites inhabited Sinai, living for the most part in the caves, which are numerous even in the primitive rocks. Then monasteries were built, the most famous being the great one of St. Catherine in Wády el-Dér (the valley of the monastery). On Serbál, too, there were many granite dwellings, and in the neighboring Pharan (Phœnicion), which was a bishop's see, there were, as the ruins show, churches and convents.

The question then is whether when the hermits first settled in the peninsula there existed a tradition as to the place of the Mountain of the Law, and whether they chose for their residence a spot which was already traditionally consecrated by memories significant to the Christian as well as to the Jew. No assertion of the existence of such a tradition is to be found in Josephus, who only says that Sinai was the highest mountain of the district—a description which might apply to Serbál as seen from the plain below. Eusebius uses expressions which may also seem to point to Serbál as the place of the law-giving, and it must be admitted that the tradition which seeks the holy site in the group of Jebel Músá (*i.e.*, the mass of which Mount Catherine is the highest peak) is not older than the time of Justinian, so that the identification with Mount Serbál seems to have greater antiquity in its favor. In later times Jebel Músá and Serbál had each its own tradition, and the holy places were pointed out at each; thus from the monastery of St. Catherine a path of granite steps was constructed up to "the Mountain of the Law," but similar steps are found at Serbál. That these traditions are not decisive, however, is admitted, more or less, even by those moderns who, like Lepsius, Ebers, Bartlett, give their voice for Serbál. Most authorities still prefer Jebel Músá or some point in that group, but they again differ in details.

SINCLAIR, SIR JOHN, BART., a voluminous Scottish author, was born at Thurso Castle, May 10, 1754. His reputation as a financier and political economist was firmly established by his publication in 1784 of the *History of the Public Revenue of the British Empire*, to subsequent editions of which was added a *Review of the Financial Administration of the Right Hon. William Pitt.* On February 4, 1786, Sinclair was created a baronet of Great Britain. He died December 21, 1835.

SIND, the westernmost territorial subdivision of India, and a frontier province of considerable importance in a geographical and political aspect, lies between the twenty-third and twenty-eighth parallels of N. latitude and between the sixty-sixth and seventy-first meridians of E. longitude. Its length from north to south is estimated at 360 miles, and the average of its breadth from east to west at 170.

Owing to the deficiency of rain, the continuance of hot weather in Sind is exceptional. Lying between two monsoons, it just escapes the influence of both. The southwest monsoon stops short at Lakhpat Bandar, the northwest monsoon at Kurrachee, and even here the annual rainfall is not reckoned at more than six or eight inches. At times there is no rainfall for two or three years, while at others there is a whole season's rainfall in one or two days. The average temperature of the summer months rises to 95° F., and the winter average is 60°, the summer maximum being 120° and the winter minimum 32°. The temperature on the sea-coast is much more equable than elsewhere. In Northern Sind we find frost in winter, while both there and in Lower Sind the summer heat is extreme and prolonged. This great heat, combined with the poisonous exhalations from the pools left after the annual inundation and the decaying vegetable deposits, produces the fever and ague with which the name of the country is associated, and to which even the natives themselves fall a prey.

The soil is largely dependent on the river overflow. This grand provision of nature is, however, uncertainly exercised; and not only is the actual volume of water supplied from the upper Indus liable to fluctuation, but the particular lands inundated or untouched by inundation vary according to the caprices of the river. Questions of alluvion and diluvion are therefore of frequent occurrence; and it is often as hard to say whether newly-thrown-up lands belong to the state or an individual proprietor as it is to decide who is the loser in the case of lands newly submerged. In the lands which, as a rule, are reached annually and in fair proportion by the inundation, the soil is so rich as to produce two crops or even more in the year without the assistance of manure. Salt is present in great quantity. The two principal yearly crops are the vernal, known as *rabi*, sown in autumn and reaped in spring, and the autumnal, known as *kharif*, sown in summer while the river is high and reaped from October to December. In some districts there is a distinct third crop called *peshras*, sown in March and reaped in July and August. The implements of husbandry are the plow (*har*), drawn by two bullocks; the harrow (*sahar*), a heavy log of wood drawn by four bullocks, a man standing on each end; the seed-sower (*nári*), a tube fixed to the plow with a wooden funnel on the top, used while the ground is being plowed for the last time; a curved hook (*dátro*) with teeth like a saw, for reaping; and a hoe (*kúriah*), for weeding.

The principal products are *bájri* (a well-known Indian grain), and *juári* (the Indian millet), rice, cotton, sugar-cane, tobacco, oil-seeds, wheat, barley, and indigo. Of these, wheat may be considered the staple produce of Upper, and *bájri* and *juári* of Middle and Lower Sind. Dates, plantains, mangoes, limes, oranges, pomegranates, citrons, figs, grapes, apples, tamarinds, mulberries, and melons are said to be fruits common to the country; and it is added that of late years nectarines, peaches, apricots, and other fruit trees have been successfully introduced, but the statement must be received with some reservation in respect of quantity and quality. There is no doubt that the fruits imported by the Afghan traders find more favor than any home products.

The population may be roughly reckoned at 2,500,000, an estimate which is borne out by the census of 1881. Kurrachee is now the most populous of the capitals, and its numbers far exceed those of Shikarpur and Hyderabad. But the character of its inhabitants differs from that of other large towns in Sind. They are for the most part foreign and migratory, and do not represent the true Sindis.

SINGAN, a form of the name Se-gan Foo.

SINGAPORE, a British dependency, commercially and administratively the most important of the Straits Settlements (*q.v.*), which form a separate colonial government. It consists principally of an island twenty-seven miles long by fourteen broad, lying off the south end of the Malay Peninsula, but also includes upward of seventy insignificant islets to the south and west within a radius of ten miles.

In climate Singapore is wonderfully fortunate for a country within one degree of the equator. There is hardly any seasonal change, and the annual range of temperature is generally only from 70° to 90°. The nights especially are very cool and refreshing, and enable people to sleep without difficulty. The atmosphere is almost uniformly serene, and the face of the ocean is only disturbed by the swell of distant tempests in the China Sea or the Bay of Bengal. The northeast monsoon is the master wind from November to April, but is generally neither persistent nor powerful, and the southwest monsoon is even less regular in its action. The southerly winds in May and June known as Java winds have very much the character of land and sea breezes, but are considered very enervating in spite of the pleasant feeling of freshness which they at first produce. Rapid squalls (sumatras) also occur during the southwest monsoon and beneficially clear the air. Instead of periodical rains there are (on a sixteen years' average) 167 wet days distributed throughout the year. The annual rainfall is 92.27 inches.

The total population is estimated to be now well over 150,000. The preponderance and rapid increase of the Chinese is a most striking feature, mainly due, however, to a steady stream of immigration.

The only town in the settlement is the city of Singapore; the general capital of the Straits Settlements. It lies on the south side of the island.

SINGBHUM, a British district in the lieutenant-governorship of Bengal, lying between 21° 59′ and 22° 53′ N. latitude, and between 85° 2′ and 86° 56′ E. longitude. It has an area of 3,753 square miles, and is bounded on the north by the districts of Lohárdagá and Mánbhúm, on the east by Midnapur, on the south by the tributary states of Orissa, and on the west by Lohárdagá and the tributary states of Chutiá Nágpur.

The census of 1881 disclosed a population of 453,775 (226,681 males and 227,094 females); Hindus numbered 447,810, Mohammedans 2,329, and Christians 2,988. The only town containing a population of more than 5,000 is Cháibásá, the civil station and administrative headquarters of the district, with 6,006 inhabitants. The staple crop of Singbhúm is rice, and the other chief crops are wheat, Indian corn, peas, gram, mustard, sugar-cane, cotton, and tobacco. The principal manufactures are coarse cotton cloths, brass and earthenware cooking utensils, and soapstone platters. Cereals, pulses, oil-seeds, stick-lac, and iron comprise the chief exports; and the imports include salt, cotton thread, English cloth goods, tobacco, and brass utensils.

SINGING. See Voice.

SING-SING, a post village of Westchester county, N. Y., on the New York Central and Hudson River railroad, thirty miles above New York city, is delightfully situated on the Hudson river at a point where the stream widens into a lake known as "Tappan Zee," and is associated with some of the most romantic incidents connected with the early history of the State, and the Revolutionary war. The village occupies an elevated plateau, the extreme height of which is 200 feet above the water's edge, the ascent being gradual and the hillsides dotted with spacious and elegant residences. The scenery in the vicinity is highly picturesque and the country for miles in every direction is a constant succession of beautiful cities, villages, and homes. Sing-Sing is the site of Trinity college and Mount Pleasant academy, a female seminary, several boarding schools under military regime, and numerous other institutions of learning besides the regular public school system. It contains two banks, two weekly papers, three monthly publications, seven churches, many stores, hotels, and places of public resort. The village is also the location of one of the State prisons of New York. The buildings, which are constructed of limestone, are massive in their proportions, and occupy a considerable area of territory on the bank of the river. Among the remaining public works is the Croton aqueduct, an arch of masonry of eighty-eight feet span, crossing a ravine on the outskirts of the town. While the village is probably more generally known by reason of its advantages for residence purposes, the industrial interests are substantially represented and maintained. These include foundries, machine shops, stove works, cotton-gin factories, file works, pill and porous-plaster works, kilns for the burning of lime, quarries, etc. The water supply is ample, and the departments of fire and police are under municipal government, while gas and electric lights are employed for purposes of illumination, and other conveniences and equipments for rapid transit, etc., are well maintained. The population in 1890 was 9,352.

SINHALESE. See Ceylon.

SINIGAGLIA, or Senigallia (the official form), a city of Italy, in the province of Ancona, in 43° 43′ 16″ N. latitude, on the coast of the Adriatic, seventeen miles by rail north of Ancona. It is well built, with broad and well-paved streets, and has the general appearance of a thriving commercial town. The population, exclusive of the suburbs, was 10,501 in 1861 and 6,634 (commune 22,499) in 1881.

SINKING FUND. See National Debt.

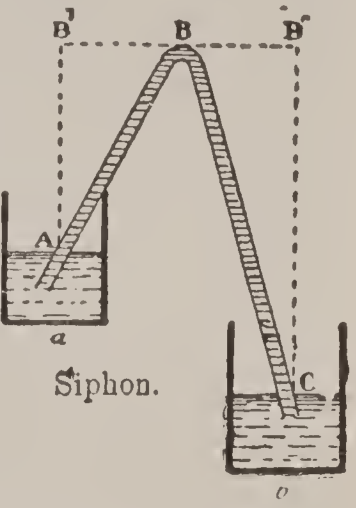
SINOPE, or in Turkish Sinûb, a town and seaport on the north coast of Asia Minor, on the isthmus and peninsula of Boztepeh, which forms part of the most northerly projection of the Anatolian seaboard. The population has not greatly changed since 1868, when it was found to be 9,668 inhabitants, of whom 7,299 were Mohammedans and 2,369 Greeks and others.

SIOUX CITY, a city typical of the enterprise and public spirit indigenous to the West, and the capital of Woodbury county, Iowa, is located on the Missouri river 100 miles north of Council Bluffs and 325 miles west of Dubuque. It was first surveyed during 1856, and incorporated the year following with a limited population and still more limited resources and facilities for progress and development. During the intervening period its growth has been gradual but permanent, and the population has steadily increased in number each decade. The city is now a railroad center of great importance, five trunk lines, the Illinois Central, Sioux City and Pacific, the Chicago, St. Paul, Minneapolis and Omaha, the Chicago, Milwaukee and St. Paul, and the Chicago and North-Western meeting here, and reaching out from Sioux City to Nebraska, Idaho, Dakota, far into the lands of Colorado, Wyoming, and beyond the Rocky mountains, complete a system of incomparable utility and importance to the entire nation. It is also the headquarters for steamboat lines engaged in the navigation of the upper Missouri, and is in direct communication by the same means with towns upon the lower Missouri and Mississippi from Kansas City to the Gulf. A large and important railway bridge nearly half a mile in length has been recently completed from the city to the Nebraska shore. Four daily and five weekly papers, one Swedish and one Norwegian, are regularly issued, also two additional publications, semi-monthly and monthly respectively. The city contains fourteen banks with a total cash capital of $3,500,000, and $500,000 surplus; twenty-five churches, an efficiently managed public school system, a court-house and city hall, both of which have been recently completed, an academy of music costing nearly $100,000, several commodious and handsomely equipped hotels and public halls, with other improvements desirable and available. Contiguous to the city are the Union Stock Yards, at which packing houses have been established, some of them having a capacity to slaughter and pack from 10,000 to 14,000 cattle, and 100,000 hogs per week. In the lines of manufacture there are factories for the production of linseed oil, flour, oatmeal, and cornmeal, spice, vinegar, and soap, planing mills, sash, door and blind factories, tanneries, machine and boiler shops, hardware specialties, etc., supplementary to which are the machine shops of the Sioux City and Pacific railroad. Commercially and in trade circles Sioux City is noted for the enterprise and substantial character of its jobbing houses, which cater to the trade and supply an annually increasing demand for particular lines of merchandise in all parts of the west and northwest. The city is well built, many miles of the streets are paved with the latest improved material, and a reliable system of sewerage is employed. It is lighted by gas and electricity, maintains adequate fire and police departments, and possesses accommodations for passenger and freight traffic from point to point equal to those of any city of equal prominence. The population in 1880 was 7,336, and in 1890 was 37,806.

SIOUX FALLS, the county seat of Minnehaha county in the newly organized State of South Dakota, is picturesquely situated on the Big Sioux river at the head of the Big Sioux Falls. As a receiving and distributing point, railroad headquarters, and financial center, Sioux Falls has acquired an enviable and extended reputation. It is one of the western termini of the Chicago, Milwaukee and St. Paul; Chicago, St. Paul, Minneapolis and Omaha; Burlington, Cedar Rapids and Northern; Illinois Central; and St. Paul, Minneapolis and Manitoba railroads, occupying separate depots and largely influential in the building up and enrichment of the city and its contemporaries. Two daily and three weekly papers are published here, the latter including publications devoted to the promotion of labor interests as also the interests of Swedish and Scandinavian residents, and three monthlies representing educational and religious organizations. There are ten banks with a combined capital approximating one million of dollars, a dozen churches, a comprehensive and complete system of education, a court-house, government building, hotels, public halls, private residences, etc. The water power obtained from the falls and river is invaluable and in general use as the motive power for operating the machinery of cornice works, factories for the production of woolen goods, gloves, brooms, cheese, brick, and other commodities, also for stone polishing and work requiring more delicate handling. A number of quarries are in the city's vicinity, from which a superior article of stone appropriate for building and ornamental uses is obtained. The city is supplied with gas works, street railways, etc., and in 1890 contained a population of 10,177.

SIPHANTO, SIPHENO, or SIPHNO (ancient Greek Σίφνος), an island of the Greek Archipelago, in the monarchy of the Cyclades, thirty miles southwest of Syra. It has an area of twenty-eight square miles, and the population in 1879 was 5,762.

SIPHON, or SYPHON, an instrument usually in the form of a bent tube for conveying liquid over the edge of a vessel and delivering it at a lower level, or in a position of less hydrostatic pressure. The principle on which it acts (see HYDROMECHANICS) may be understood from the accompanying diagram. ABC is a tube filled with liquid, the shorter limb dipping under the surface of the liquid in jar *a*, the longer in jar *b*. The pressure in the tube at A is atmospheric pressure minus that of the vertical column AB′, while that at C is atmospheric pressure minus that of the column CB″. When CB″ is longer than AB′ the pressure at C is of course less than that at A, and a current flows in the direction ABC through the siphon. When AB′=B″C, that is, when the liquid stands at the same level, pressure is equal in the two limbs, and the current ceases. The siphon has practically a certain minimum diameter for each liquid; as capillarity prevents a fluid from flowing out of tubes of very small bore unless under the influence of electricity, heat, or great pressure. The instrument is largely employed for chemical work, both in the laboratory and in manufacturing processes; it is formed of glass, india-rubber, lead, or other substance, according to the purpose for which it is intended.



Siphon.

SIRACHIDES. See JESUS, THE SON OF SIRACH.

SIRÁJGANJ, a town in the district of Pabna, Bengal, and the most important river-mart in that province, is situated near the Jamuná or main stream of the Brahmaputra in 24° 26′ 58″ N. latitude and 89° 47′ 5″ E. longitude, with a population of 21,037 (11,213 males and 9,824 females) in 1881.

SIR-DARIA. See SYR-DARYA.

SIREDON. At the end of last century specimens of a kind of branchiate tailed Amphibian were brought to Europe from the lakes of Mexico; they were examined by the zoölogists of Paris and described by Cuvier in Humboldt's *Recueil d'Observations de Zoölogie*, vol. i., and by Daudin in *Hist. des Reptiles* (Paris, 1802–1804), under their native name of *Axolotls*. The animals were named *Siren pisciformis* by Shaw. (*Zool.*, vol. iii.) Wagler, in his *Natürliches System der Amphibien* (Stuttgart, 1828–1833), separated the axolotl from the Linnæan genus *Siren* and called it *Siredon axolotl*, and later writers have often referred to the animal under the name *Siredon pisciforme*, Shaw.

The axolotl of Mexico is about six or seven inches in length; it has four pairs of gill-slits and three pairs of long feather-like external branchiæ. The branchial apertures are between the hyoid arch and the first branchial arch, and between the first-second, second-third, and third-fourth branchial arches. The branchiæ are attached to the first, second, and third branchial arches. The body is cylindrical, and a median membranous fin extends along the trunk dorsally, is continued along the tail, passes round the end of the latter and terminates ventrally at the anus. It has four limbs, which are short and somewhat stout; the anterior terminate in four and the posterior in five digits. The color of the axolotl is a uniform black.

The animal is therefore, except in size, very similar to aquatic larva of *Triton*, or other Salamandroid.

SIREN. *Siren lacertina*, Lin. (*Syst. Nat.*, i., Addenda), is an animal belonging to the class AMPHIBIA, (*q.v.*) It forms the type of the family *Sirenidæ*, called by Professor Huxley *Trachystomata*, among the group *Perennibranchiata*. The body is elongate and eel-like, only the anterior limbs being present; the posterior are entirely wanting. The anterior limbs are short and feeble, and each is furnished with four digits pointed at the ends. The head is small; the snout is short and broad, and the nostrils are placed at its extreme end. The tongue is free anteriorly. The jaws are destitute of teeth and covered with a horny sheath like a beak. There are numerous teeth on the vomer, arranged in two large patches converging anteriorly. The eyes are very small. On each side of the neck are three branched external gills attached to the first, second, and third branchial arches; and below the gills are three reduced branchial apertures. The tail is shorter than the body, much compressed, and provided with a median membranous fin; the tail terminates in a point. The skin is smooth, and black in color, sometimes sprinkled with white dots. *Siren* grows to a large size, some specimens measuring three feet in length; the largest example in the British Museum is 670 mm. or about two feet three inches. The animal inhabits the stagnant waters of marshes in South Carolina and Texas.

SIREN, or **SYREN.** A fog-horn.

SIRENS, fabulous creatures of Greek mythology, that, like the Loreley of German legend, lured mariners to destruction by their sweet song. In the *Odyssey* Ulysses sails past their island; but, warned by Circe, he had stopped the ears of his crew with wax and caused himself to be bound to the mast. In Homer they are two in number, but in later writers they are generally three, and are located on the coast of Italy, near Sorrento and Capri, or on the Straits of Messina.

SIRICIUS, pope from December, 384, till November, 398, was the successor of Damasus, and was himself succeeded by Anastasius I.

SIRMÚR, one of the sub-Himalayan or Simla hill states under the government of the Punjab, lying between 30° 24′ and 31° N. latitude, and between 77° 5′ and 77° 50′ E. longitude. Its area is 1,096 square miles, and it is bounded on the north by the hill states of Balsan and Jubal, on the east by the British district of Dehra Dun, from which it is separated by the rivers Tons and Jumna, on the southwest by Ambala district, and on the northwest by the states of Patiála and Keunthál.

The population in 1881 was 112,371 (males 63,305, females 49,066), the great majority being Hindus. The only town of any importance is Nahan, with a population of 5,253. The principal products of the state are opium, tobacco, and cereals.

SIROHI, or **SEEROEE**, a native state in the Rájputána agency under the government of India, with an area of 3,020 square miles, lying between 24° 20′ and 25° 20′ N. latitude, and between 72° 10′ and 73° 10′ E. longitude, and bounded on the west and north by Márwár or Jodhpur, on the east by Mewár or Udáipur, on the south by Pálanpur and the Mahi Kántha states of Edar and Dánta.

In 1881 the population numbered 142,903 (males 76,132, females 66,771), of whom 123,633 were Hindus, 2,935 were Mohammedans, and 16,137 were Jains. The town of Sirohi, the capital of the state, is situated at the western base of the range of hills north of Mount Abu, and its population (1881) numbered 5,699. Wheat and barley are the staple crops; pulses and cotton are also grown.

SIRSA, a British district in the lieutenant-governorship of the Punjab, lying between 29° 13′ and 30° 40′ N. latitude and between 73° 57′ and 75° 23′ E. longitude. It has an area of 3,008 square miles, and is bounded on the north by Firozpur district and the native state of Patiála, on the west by the river Sutlej, on the southwest by the native states of Baháwalpur and Bíkaner, and on the east by Hissar district.

The population of the district, according to the census of 1881, was 253,275 (males 138,691, females 114,584), of whom 130,582 were Hindus, 93,289 Mohammedans, and 28,303 Sikhs. The only town with a population exceeding 10,000 is Sírsa, the administrative headquarters of the district, with 12,292 inhabitants. The modern town of Sírsa was founded in 1837, and the ruins of old Sírsa lie near its southwest corner. It is a considerable entrepôt for the trade of the wheat-growing countries to the north and east with Bíkaner and Márwár. At the opening of the present century nearly the whole of Sírsa district was a barren almost uncultivated waste. Gradually, however, with more peaceful times cultivation has again extended. Of the total area 1,353 square miles are now cultivated and 1,548 square miles are cultivable. The staple product is bajra; the other principal crops are joar, barley and wheat. The district has little trade except in agricultural produce, which goes chiefly to Bíkaner; and the only manufacture of any importance is that of *sajji*, an impure carbonate of soda, used in washing and dyeing cloth.

SISKIN (Dan. *Sidsken;* Germ. *Zeisig* and *Zeising*), long known in England as a cage-bird, since, in 1544, Turner mentioned it in that character under this name, and said that he had only once met with it at large—the *Fringilla spinus* of Linnæus, and *Carduelis* or *Chrysomitris spinus* of modern writers. In some of its structural characters it is most nearly allied to the Goldfinch, and both are often placed in the same genus by systematists; but in its style of coloration, and still more in its habits, it resembles the Redpolls, though without their slender figure, being indeed rather short and stout of build. Of an olive-green above, deeply tinted in some parts with black, and in others lightened by yellow, and beneath of a yellowish-white again marked with black, the male of this species has at least a becoming if not a brilliant garb, and possesses a song that is not unmelodious, though the resemblance of some of its notes to the running down of a piece of clockwork is more remarkable than pleasing. The hen is still more soberly attired; but it is perhaps the Siskin’s disposition to familiarity that makes it so favorite a captive, and, though as a cage-bird it is not ordinarily long-lived, it readily adapts itself to the loss of liberty.

SISMONDI, **JEAN CHARLES LEONARD DE**, a Swiss author, whose real name was SIMONDE, was born at Geneva on May 9, 1773. His first book was *Tableau de l’Agriculture Toscane*, which, after returning to Geneva, he published there in 1801. Two years later he published his *Traité de la Richesse Commerciale*, his first work on the subject of political economy. Meanwhile he began his great *History of the Italian Republics*. On completing this great work, he undertook a still greater, the *Histoire des Français*, which he planned on a vast scale, and of which, during the remaining twenty-three years of his life, he published twenty-nine volumes. He died at Geneva on June 25, 1842. Besides the works above mentioned he had executed many others, his custom for a long period of years being never to work less than eight hours a day. The chief of these are *Nouveaux Principes d’Économie Politique* (1819), an historical novel entitled *Julia Severa ou l’An 492* (1822), *Histoire de la Renaissance de la Liberté en Italie* (1832), *Histoire de la Chute de l’Empire Romain* (1835), *Précis de l’Histoire des Français*, an abridgment of his own book (1839), with several others, chiefly political pamphlets.

SISTÁN, or SEISTAN (SEJISTÁN), the ancient *Sacastane* (*Çaksthána*, "land of the Sacæ") and the *Nimrúz* or "meridies" of the *Vendidad*, is situated generally between 30° 0′ and 31° 35′ N. latitude and 61° 0′ and (including Rudbár) 62° 40′ E. longitude. Its extreme length is about 100 and its breadth varies from 70 to over 100 miles—but the exact limits are vague, and the modern signification of the name practically comprehends the peninsula formed by the lower Helmand and its embouchure on the one side and the "Hámún" or "lake" on the other.

The whole area is estimated at 947 square miles. The fixed population may be roughly stated at 35,000—some 20,000 Sistánis and 15,000 settlers—the greater part of whom are Parsiwans, or rather, perhaps, a Persian-speaking people. To the above numbers may be added 10,000 Baluch nomads.

Provisions in Sistán are, as a rule, sufficient, though sheep and oxen are somewhat poor. Bread is cheap and good, being procurable to natives at less than a halfpenny the pound. Vegetables are scarce, and rice is chiefly obtained from Herat. The inundated lands abound with water-fowl. Partridges and sand-grouse are occasionally seen. River fish are plentiful enough, but confined to one species, the barbel.

The inhabitants of Sistán are mainly composed of Kaiyánis, descendants of the ancient rulers of the land; Sarbandis and Shahrakis, tribes supposed to have consisted originally of immigrants from western Persia; and Baluchis of the Nharui and Sanjurani (Toki) clans. Bellew separates the "Sistánis;" but it is a question whether this term is not in a large measure applied to fixed inhabitants of the country whatever their descent and nationality.

SISTOVA, a town of Bulgaria, at the head of a district of its own name (40,893 inhabitants in 1881), is situated on the right bank of the Danube, about forty miles above Rustchuk, and has rather a picturesque appearance on the slopes of the Ḳadbair and the Chuka. More than half the inhabitants, who numbered 11,560 in 1881, are Bulgarians, the rest being Turks, Walachians, and Gipsies.

SISTRUM, a kind of rattle used by the ancient Egyptians in religious ceremonies, especially in the worship of Isis. It consisted of a frame through which passed four rods; attached to the frame was a handle. When shaken the rods rattled and produced the sound.

SISYPHUS, a famous character of Greek mythology, was a son of Æolus and Enarete and brother of Cretheus, Athamas, and Salmoneus. When Death came to fetch him, Sisyphus put him into fetters, so that no one died till Ares came and freed Death, and delivered Sisyphus into his custody. But Sisyphus was not yet at the end of his resources; for before he died he told his wife that when he was gone she was not to offer the usual sacrifice to the dead. So in the under world he complained that his wife was neglecting her duty, and he persuaded Hades to allow him to go back to the upper world and expostulate with her. But when he got back to Corinth he positively refused to return to Deadland; so he lived to a good old age, and even then Hermes had a tough job to carry him off. In the under world Sisyphus was compelled to roll a big stone up a steep hill; but before it reached the top of the hill the stone always rolled down, and Sisyphus had to begin all over again.

SITÁPUR, a British district in Sitápur division or commissionership of Oudh under the jurisdiction of the lieutenant-governorship of the Northwestern Provinces of India. It lies between 27° 7′ and 27° 53′ N. latitude and between 80° 21′ and 81° 26′ E. longitude, and it is bounded on the north by Kheri district, on the east by that of Bahraich, from which it is separated by the Gogra river, and on the south and west by Bara Banki, Lucknow, and Hardoi districts, the Gumti river forming the boundary. In 1881 the population was returned at 958,251. Sitápur contains but two towns with more than 10,000 inhabitants—namely, Khairabad, 14,217, and Laharpur, 10,437. The administrative headquarters of the district are at Sitápur town, which is prettily situated on the banks of the Saráyan river, with good groves in all directions, and with a population in 1881 of 6,780. Of the total district area 1,455 square miles are cultivated and 510 are cultivable. The principal staples are wheat, barley, joar, gram, bajra, and rice; besides these a considerable quantity of sugar-cane is raised, as also oil seeds, cotton, and tobacco. The only manufactures of any note are tobacco and tazias at Biswán, with a little cotton printing and weaving in most of the towns.

SITTINGBOURNE, an ancient town of Kent, England, is situated on a navigable creek of the Swale, and on the London, Chatham and Dover railway, at the junction for Sheerness, seven miles south from the latter town and forty-five east-southeast of London. The population of the urban sanitary district (area 1,004 acres) in 1871 was 6,148 and in 1881 it was 7,856.

SIÚT, or ASYÚT (ASIOOT), more correctly OSYÚT, a town of Upper Egypt, and southern terminus of the railway on the left bank of the Nile, by which it is 229 miles from Búlák Dakrúr. The population is about 25,000.

SIVA. See BRAHMANISM.

SÍVÁS, or SÍWÁS, a pashalic and capital of a pashalic of great importance in Asia Minor. The town is situated on the right bank of the Kizil Irmak (Halys), in a plain of some sixteen to twenty miles in length and four to six in breadth. The population, estimated on the spot in 1864 at 10,000 houses, more than a fifth being Armenians, is stated in Murray's *Handbook* of 1878 to consist of 5,000 Turkish and 1,200 Armenian families. There are some respectable residences but not many buildings or monuments of note.

SIXTUS I. (XYSTUS) figures in the lists accepted by the Roman Church as having been bishop of Rome from about 119 to about 126. He is conjectured to have been a presbyter and a martyr.

SIXTUS II. followed Stephanus I. as bishop of Rome in 257, and suffered martyrdom under Valerian in the following year. He restored the relations with the African and Eastern Churches, which had been broken off by his predecessor on the question of heretical baptism. Dionysius succeeded him.

SIXTUS III., bishop of Rome from July 31, 432, to August 18, 440, had Cœlestinus I. as his predecessor, and was succeeded by Leo I.

SIXTUS IV. (Francesco della Rovere), pope from 1471 to 1484, was born July 21, 1414, near Savona. The statements respecting his parents' situation in life are very conflicting. In consequence of a vow made by his mother he entered the Franciscan order at an early age, and speedily acquired a great reputation for eloquence and learning. After filling several minor offices he became general of his order, and in 1467 was, to his own surprise, made cardinal by Paul II., at the recommendation, it is asserted, of Cardinal Bessarion. He was elected pope on August 9, 1471, and immediately proceeded to lavish Paul's treasures. He died August 13, 1484, leaving an unfortunate reputation as the first pope who brought nepotism into politics, and, not content with enriching his relatives by gifts and lucrative offices, made their aggrandizement the principal object of his policy as a secular prince.

SIXTUS V. (Felice Peretti), pope from 1585 to

1590, was born December 13, 1521, at Grottamarina, in the district of Fermo, Italy. After having been successively professor at Rimini and at Siena, he became inquisitor-general in Venice (where his firmness in controversy with the Venetian Government exposed him to personal danger), theologian at the council of Trent, and ultimately vicar-general of his order. In 1565 he accompanied the papal legate to Spain, and in 1570 was created cardinal by Pius V., and intrusted with the publication of a correct edition of the works of St. Ambrose, which appeared in 1579–1585. Finding himself out of favor with Pius' successor, Gregory XIII., he withdrew to a villa which he had purchased, and lived in strict retirement, affecting, it is said, to be in a precarious state of health. According to the usual story, which is probably the least exaggerated, this dissimulation greatly contributed to his unexpected elevation to the papacy on the next vacancy, April 24, 1585. The death of the pope on August 27, 1590, was attributed by many to poison, though without sufficient ground. He was succeeded by Urban VII. Sixtus V. left the reputation of a zealous and austere pope—with the pernicious qualities inseparable from such a character in his age—of a stern and terrible but just and magnanimous temporal magistrate, of a great sovereign in an age of great sovereigns, of a man always aiming at the highest things and whose great faults were but the exaggeration of great virtues.

SKATE. See Ray.

SKATING, as at present practiced, may be defined as a mode of progression (usually rapid) upon smooth ice, by the aid of steel blades attached to the soles of the feet. It probably originated in the far north of Europe, in Scandinavia and Germany, where it is still in common use. In Russia it has never been a national pastime, as no smooth ice is formed in the rapidly running rivers. Even in St. Petersburg it is mainly engaged in by English and Germans. The earliest skates appear to have been certain bones of large animals, but wood was also used from an early period.

In modern skating there are two totally distinct styles, which require different skates differently attached to the feet, and different extents and qualities of ice. The first, the "running" or "fen" style, simply consists in going straight ahead at the highest possible speed. Its home is on the fiords of Scandinavia, the fens of Lincolnshire, and the large rivers and lakes of North America. In Holland, Denmark, and North America it is the medium for carrying on a large winter market traffic. It first became common in England in 1662 after the return of the Stuarts.

The fastest skating times recorded, from a standing start, and with no rear wind, have all been made in the United States, at New York, as follows:—100 yards, $10\frac{3}{8}$ s.; 200, $21\frac{5}{8}$ s.; 300, $31\frac{2}{5}$ s.; $\frac{1}{4}$ mile, $44\frac{1}{5}$ s.; $\frac{1}{2}$, 1 m. $41\frac{4}{5}$ s.; $\frac{3}{4}$, 2 m. $34\frac{2}{5}$ s.; 1, 3 m. $26\frac{2}{5}$ s.; 2, 6 m. $56\frac{1}{5}$ s.; 3, 10 m. $33\frac{2}{3}$ s.; 4, 14 m. $10\frac{1}{2}$ s.; 5, 17 m. 45 s.; 6, 21 m. 38 s.; 7, 25 m. $17\frac{4}{5}$ s.; 8, 29 m. $9\frac{4}{5}$ s.; 9, 32 m. 54 $\frac{1}{5}$ s.; 10, 36 m. $37\frac{1}{5}$ s.; 20, 1 h. 14 m. $7\frac{1}{5}$ s.; 30, 2 h. 31 m. 12 s.; 40, 3h. 21 m. 22 s.; 50, 4 h. 13 m. 36 s. The best running high jump on skates recorded is 3 ft. $1\frac{3}{4}$ in., and running long jump 15 ft. 2 in.

The second style, termed "figure skating," is quite modern. This may be practiced on any small pond, provided the ice is clear of snow and perfectly smooth. The modern skate is made entirely of metal, is strapless and fixed to the boots by clamps or like devices. It can be instantly put on or taken off. Many kinds have been invented, but the "American Club," first produced in the United States, is generally acknowledged the best. The blade projects the merest trifle beyond the length of the foot and is rounded off in an upward direction from the ice at both toe and heel. The bottom is one-fourth inch wide, and the best curve for grinding it is to that of a seven-foot radius, equal throughout and not increased at either end. In stopping, the end of one skate is placed at right angles to the other.

In the United States and Canada large and shallow artificial ponds under cover, termed "rinks," are in winter frozen by filling them with water. Each night the surface is covered with a layer of water, which gives a fresh sheet of ice by morning. The covers protect the rinks from snow, another great advantage.

As regards a substitute for ice and ice skating on wooden or asphalt floors, the only invention that has ever been found even partially successful is that of James L. Plimpton of New York in 1869. The implements may be described as skates with two parallel wheels at the toe and heel, so hung that the wheel axles are moved out of parallel by the transverse rocking of the skater's foot, the wheels setting squarely on the surface whether the skater be upright or canted. The fatigue caused by these "roller skates" is quadruple that of ordinary ice skating.

SKELETON. The word "skeleton," meaning in Greek a mummy, is popularly taken to denote that assemblage of bones and cartilages which forms the internal support of the body of man and of the animals more or less nearly resembling him. A slight acquaintance with the structure of these animals, however, seems to make it evident that a wider signification must be given to the term, since parts which in man and many of his animal allies are bony or cartilaginous may be only membraneous in other such animals; and, conversely, parts sometimes quite external, which are nearly membraneous in man and many animals, may in others assume the structure of horn or bone, or may contain bones or cartilages. The word skeleton may indeed be taken to denote both a more or less firm or complete *external* protection to a living body, and also a more or less firm or complete *internal* support to such body.

In this very wide sense even many vegetal structures may be said to possess a skeleton. For all plants which can sustain themselves in an upgrowth from the ground obviously both require and possess solid structures—various groups and varieties of woody fibers—to support such an upgrowth. Organs also, such as leaves, which need to be maintained in the form of a thin, flat expanse, require and possess bundles of fibers (vulgarly called veins) which are even popularly said to constitute the skeleton of the leaf. Many plants form such skeletal structures largely of silex, as do the grasses and the horsetails (*Equisetum*), and others invest themselves to a greater or less degree with carbonate of lime, as do some *Algæ*, such as *Corallina* and *Melobesia*, while the *Desmidiæ* clothe themselves with a horny coat. Ordinarily, however, the word skeleton is only used to denote certain animal structures, and mainly such structures as form the skeleton of man and of creatures so nearly allied to him as to constitute, together with him, that primary division of animals known as backboned animals or *Vertebrata.*

The Skeleton of Vertebrata.—The skeleton of the *Vertebrata*—that is of the five classes of animals named *Pisces*, *Amphibia*, *Reptilia*, *Aves*, and *Mammalia*—may in the first place be most conveniently considered as consisting of two parts—a dermal skeleton, *exoskeleton*, and an internal framework, or *endoskeleton*. The latter, which is generally much the more considerable, is mesoblastic, and the muscles are external to it.

External Skeleton of Vertebrata.—This division of the skeleton is itself again made up of two parts. The more external of these is the epidermis and is of epiblastic origin, and dense epidermal structures may arise toward its inner or its outer surface. The more internal constituent of the exoskeleton is the dermis and dense structures formed in it, and these are from the outer portion of the mesoblast.

Epidermal hard structures formed toward either surface of the epidermis may become intimately united with subjacent dermal hard structures, and then again, as we shall see, with parts of the true endoskeleton.

Any hard structures formed in the walls of the alimentary canal—the lining of which is continuous at either end with the external skin—are to be reckoned as fundamentally exoskeletal. In the process of development the epiblast becomes inflected more or less into either extremity of the alimentary tube, but the intermediate portion, together of course with any hard structures developed in it, is of hypoblastic origin.

In the great majority of Vertebrate animals the two layers of the skin, the epidermis and the dermis, are, as in man, soft, though locally provided with certain denser appendages, such as epidermal and dermal scales, hairs, nails, scutes, and teeth.

The soft, general exoskeleton or skin invests the body of Man pretty closely, though slightly projecting folds of it extend between the roots of the fingers and toes. In some abnormal cases these folds extend so far and bind the digits together so much that the thus malformed person is said to be "web-fingered" or "web-toed." Such a condition is found normally in many animals, as notably in Ducks and Geese, and such parts form a large portion of the "wing" of the Bat.

Other extensions of the skin of the body are noteworthy. Thus in the "Flying" Squirrels and Opossums, and the curious Rodent named *Anomalurus*, the skin of the sides, between the arms and the legs, is much expanded, serving for a parachute. There may be a skin parachute supported by long free movable ribs, such as we shall see exist in the little Lizards called "Flying Dragons." There may be a very remarkable extensive skin round the neck, as in the Frilled Lizard, and folds of skin may hang freely, as in the "dewlap" of Cattle, or may be formed here and there as in the Rhinoceros, the skin of which animal is so thick as to necessitate the existence of such folds to allow free movements to the body and limbs. Long filamentary processes may be formed along the back, as in the Iguana and various other Lizards.

In the Seals a fold of skin connects together the hind legs and the tail, and also in our common Bats, which have in addition their very elongated webbed fingers connected with the sides of the body and legs by another great fold of skin which, with those between the fingers, forms the entire bat's "wing."

The integument may be very distensible, as in those Fishes (*e.g.*, *Diodon*) which distend themselves with air and then float belly upward.

The epidermis of many Vertebrates, and of Man, is shed in minute fragments, constantly removed by friction and ablution, and constantly replaced; only under abnormal conditions and after certain diseases does it come away in large and continuous patches. In some other Vertebrates, as notably in Snakes, the entire epidermal investment of the body, even that of the eyes, is cast off entire as one whole.

The epidermis never has its superficial layer connected with bone, but it often becomes thickened and horny, as we see in the sole of the foot, or the laborer's hand, and in those abnormal thickenings called "corns." Certain local thickenings which are not abnormal may exist in animals; such are the callosities on the inner side of the legs of the Horse, on the breast of the Camel, and on the nates of the lower Old-World Apes.

Internal Skeleton of Vertebrata.—The most essential part of the vertebrate internal skeleton is the spinal column, the foundation of which is laid by a temporary or permanent structure called the notochord or *chorda dorsalis*. At the anterior end of the spinal column there is almost always a solid structure known as the cranium or skull, to which mandibular, hyoidean, and branchial arches may or may not be attached. The spinal column may be divisible into cervical, thoracic, lumbar, sacral, and caudal portions, and may have processes projecting from it upward, downward, or laterally, with arches of varying extent, as neural arches, chevron bones, and ribs, together with a median ventral portion—the sternum. The whole of these parts taken together constitute the axial skeleton. This may exist alone if the body is limbless, but otherwise additional hard structures are found which together constitute the appendicular skeleton.

Vertebrate animals never have more than two pairs of limbs, and each pair is attached to the body by the help of certain skeleton elements termed a limb-girdle, diverging from which are the hard parts which constitute the skeleton of either "appendage" or "limb." In addition to these we find in Fishes certain azygous structures—the unpaired fins—the osseous or cartilaginous supports of which must be reckoned as a part of the appendicular skeleton. With the occasional (or possibly constant) exception of the notochord, the whole Vertebrate internal skeleton is a mesoblastic structure. In the great majority of the *Vertebrata* the skeleton is more or less bony, but it always in part consists of cartilaginous and fibrous structures.

The number and nature of the solid parts vary with age in the same species. When, in the earlier stages of existence, the process of ossification has once begun, it goes on more or less rapidly till maturity is attained, and is continued, to a certain extent, throughout the whole of life.

The points at which bone formation begins and whence it radiates are termed "centers of ossification," and there may be one, two, or several of these in what is ultimately to become a single bone. Sometimes these "centers" have an important morphological significance, and in other instances they would seem to be determined by the size of the future structure. Bones are classed as "cartilage bones" or "membrane bones" according as they are formed either through the previous formation of a cartilage which subsequently ossifies or directly from membrane without the intervention of cartilage. These two classes can generally be easily distinguished, but there are instances in which it would seem that what is really the same corresponding bone differs as to its mode of origin in different animals. Moreover, a compound bone, formed of a membrane bone and a cartilage bone intimately united, may come to lose either its cartilaginous or its membranous elements, and thus further difficulties of interpretation may arise. There are also cases (as in the carapace of Chelonians) in which exoskeletal dermal bones coalesce with subjacent bones of the endoskeleton. Such bones may become deeper in position as development advances, and there is reason to think that not a few bones ordinarily reckoned as parts of the endoskeleton are of dermal origin, and first appeared in ancestral forms as placoid scutes or dermal spines.

As the development of the skeleton proceeds, ossification tends to fuse together more and more bones which at their first appearance were separate and distinct. This is notably the case in warm-blooded animals, and is most noteworthy in the warmest-blooded class—that of birds. Besides the coalescence of distinct bones, another fusion of bony structures occurs. This is due to the fact that the ends, or projecting portions, of what are essentially and ultimately one bone may for a time persist as distinct bony parts, termed "epiphyses" Thus, in the case of man, the ends of the long bones of the limbs are at first separate from the main part (or shaft) of each long bone, and do not become continuous with the latter till the human frame has nearly attained maturity.

The hard parts of the internal skeleton, being those which as a framework support the body, form points of attachment for the muscles which move the body—such hard parts being used as either levers or fulcra, as the case may be. The great majority of the bones are thus intended to move one upon another. The contiguous surfaces of bones form "joints," which may be immovable, mixed, or movable. The bones of the skull are united by immovable joints, called "sutures." Joints are said to be mixed when the motion allowed is exceedingly slight, as when two bones are allowed to be slightly separated from each other by the intervention of a softer substance which is attached to both. We have examples of movable joints in the human neck, the two uppermost bones of which are articulated on the principle of a pivot; in the elbow, which forms a hinge; and in the shoulder, where the upper arm joins the shoulder-blade in a ball and socket joint.

If one convex articulating surface be globular, it is termed a head; if it be elongated, it is called a condyle. If either of these is borne upon a narrow portion of bone, this latter is called a neck; if a pulley-like surface is formed by such a juxtaposition of two condyles as to leave a depression between them, such an articular surface is named a trochlea.

The curious and exceptional arrangement termed a shackle joint has been already noticed under the head of "Scutes."

Axial Skeleton.—The whole axial skeleton—including both the cranium and the spinal skeleton—apart from the notochord, is formed from the mesoblastic tissue bordering the medullary groove of the embryo. As the essential part of the axial skeleton is the spinal column, so the essential foundation of this column itself is what is known as the "notochord." This is an elongated cylindrical rod of soft tissue running along the antero-posterior axis of the body immediately subjacent to the central portion of the nervous system. Its mode of origin from the germ-layers of the embryo has yet to be finally determined. It is said by Balfour to be developed, in most if not all cases, as an axial differentiation of the hypoblast. The cells of the notochord form a tissue resembling cartilage, and it becomes surrounded by a more or less dense fibrous sheath. Such an organ is found to exist, temporarily or permanently, in certain lower creatures—Ascidians—which in most other respects widely differ from Vertebrate animals. Some few of these animals are furnished with a tail throughout the whole of life, while others are furnished with such an organ only in their larval or immature condition. It is alone in such permanent or temporary tail, and not in the body of Ascidians, that a structure of this kind is met with.

In every Vetebrate animal the notochord is the first part of the skeleton to appear, and it extends throughout the whole length of the body, as well as of the tail. In every such animal, except the Lancelet (*Amphioxus*), it becomes arrested anteriorly in the midst of that secondarily formed skeletal region which becomes the skull. In *Amphioxus*, however, in which no skull is ever formed, the notochord extends to quite the anterior end of the body. It is inclosed in a strong sheath, within which its substance is segmented so as to resemble a longitudinal series of coins or counters. The only other representatives of the internal skeleton in this animal are—(1) longitudinal ligaments (strengthening the sheath of the notochord above and below); (2) fibrous septa which pass out laterally from it between the muscles of the body, to the fibers of which they give attachment; (3) a longitudinal membranous sheath of the central part of the nervous system, forming an elongated antero-posteriorly directed cylinder above the notochord; (4) two vertical septa—one dorsal, ascending medianly from such neural sheath, and one ventral, descending medianly from the sheath of the notochord in the region of the tail; (5) two jointed cartilaginous filaments which lie one on each side of the longitudinal slit which serves the lancelet for a mouth; and (6) certain cartilaginous filaments which strengthen the sides of the branchial cavity between the intervening vertical fissures of the walls of that cavity.

In all other Vertebrate animals the axial skeleton is divisible into that of the head, or the cranial skeleton, and that of the axial skeleton behind the head, or the spinal skeleton.

Spinal Skeleton.—In all Vertebrate animals except the Lancelet, the axial skeleton is complicated by a longitudinal series of additional hard parts—cartilaginous or osseous—which serve to protect the spinal cord, or marrow, above it, or the great blood-vessels beneath it, and which hard parts support, encroach upon, or replace the notochord itself. Nevertheless, the notochord persists throughout the whole of life in certain Fishes of both the lowest and highest types of piscine organization, but it does not persist in its entirety in any adult Vertebrate which is not a Fish.

In the Lamprey the notochord persists, but a longitudinal series of small, similarly shaped cartilages strengthen the sides of the more anterior part of the membranous dorsal canal which incloses the spinal marrow. In the Chimæra these are more developed, while numerous circular calcifications appear in the notochordal sheath. In the most anterior part of the trunk the cartilaginous elements unite to form a continuous investment of the notochord. Among the Ganoid Fishes, the notochord persists unconstricted and cylindrical in the Sturgeon and the Lepidosiren, but cartilaginous or bony parts appear about it and form a longitudinal series of arches above and below it for the protection respectively of the spinal marrow and sub-vertebral blood-vessels. In different kinds of Sharks further complications arise, and the notochord becomes encroached upon, in different modes, by chondrification and calcification, till it becomes segmented by the intervention of a series of thus formed hard parts called "bodies" or "centra," between which relics of the notochord still remain. By this process of segmentation there come to be formed what are called vertebræ, the presence of which in the overwhelming majority of Fishes, as well as in all the higher classes of animals, has led to the whole group being called *Vertebrata.*

In the vertebræ of most vertebrates we have a solid body or centrum from the dorsum of which there arises on each of its two sides a neural plate, which then bends inward to meet its fellow of the opposite side, thus forming an arch (the neural arch) for the protection of the spinal cord, or marrow, which passes through it. From the dorsal side of such neural arch a process, called the neural spine very commonly ascends. From the sides of the centrum or neural arch, or of both, a single process, or two superimposed processes, may jut outward, which are known as the transverse process or processes, to which the ribs are generally articulated when ribs are present. Inferiorly directed processes, single or double, may descend from beneath the centrum, or may be developed in the intervals between adjacent centra, and are generally related to the protection of large blood-vessels, though they may only serve for muscular attachment.

Adjacent vertebræ are commonly connected together by special modifications of the neural arches or the centra, or of both. Mostly the opposed margins of the neural arches develop special processes for attachment called articular processes or zygapophyses, and there may be additional interarticulations. There may be as few as ten or as many as four hundred vertebræ.

Vertebræ may be divisible, as in the highest animals, into five categories:—(1) cervical, or those of the neck; (2) dorsal, or those of the back; (3) lumbar, or those of the loins; (4) sacral, or those with which the pelvic limbs are connected; and (5) caudal, or those which are posterior to the sacral vertebræ, or which support the tail when such an organ is present. There may be only two categories (dorsal and caudal), as in Fishes

In most Fishes and some exceptional Reptiles the body or centrum of each vertebra is so imperfectly ossified as to remain biconcave or amphicœlous—that is to say, it presents a deeply concave cup-like form both in front and behind. The space thus inclosed by the adjoining cups of each pair of successive vertebræ is filled up by a soft, spheroidal remnant of the notochord, which thus serves as an intermediate connecting substance. The cups may become filled up by ossification, as in Man and Beasts, the flattened surfaces being connected by what are called intervertebral disks. Each such disk is made of fibrous lamellæ which surrounds a soft elastic central portion which is a last remnant of the notochord. Often the vertebræ may have the centrum very convex at one end and very concave at the other, and so give rise to a ball-and-socket joint at each junction between the successive centra. Such vertebræ may be procœlous (*i.e.*, have the cup in front and the ball behind), as in existing Crocodiles, or opisthocœlous (*i.e.*, with the cup behind and the ball in front), as in the Bony Pike Fish (*Lepidosteus*), the Land Salamander, and the cervical vertebræ of Ruminants; sometimes a vertebra may be biconvex (*i.e.*, have a ball at each end of its centrum), as in the first caudal vertebra of the Crocodile; or, very rarely, there may be two prominences, or the cups may exist side by side on one surface of a centrum, as in some cervical vertebræ of Chelonians. Instead of intervertebral disks, with spheroidal remnants of the notochord, adjacent vertebræ are often (as in Snakes) united by what are called synovial sacs, or membranous closed bags containing an albuminous fluid called "synovia" and commonly known as "joint-oil."

The various parts of a vertebra may be all united to form one single bone, as is generally the case in the higher animals, but such is by no means universally the case. In the Ichthyosaurus we find the neural arch permanently distinct from the centrum; and in the Carp the transverse processes are separate. The neural arch itself may be made up of two separate pieces on each side, as in some Elasmobranch Fishes, *e.g.*, *Raia* and *Spinax*.

Sometimes the neural arch, instead of reposing upon its own centrum only, appears, as it were, shifted so as to be connected with two adjacent centra, as is the case, *e.g.*, with the dorsal vertebræ of Tortoises.

Generally the nerves which pass outward from the spinal marrow which lies in the neural canal pass out of the intervals between adjacent neural arches. Instead of this, however, they sometimes perforate the neural arch.

Neural spines, though generally single, may be double or altogether absent, and sometimes, as in Tortoises, they may intimately coalesce with superimposed dermal plates.

Sternum.—The breastbone or sternum extends more or less along the middle line of the ventral region of the anterior part of the trunk in all Vertebrates above Fishes, except Serpents and a few other Reptiles.

Almost always it is connected with the more anterior ribs. Its anterior end is distinguished as the manubrium or presternum, and its hinder is called the xiphoid process or xiphisternum—the middle part being the "body" or mesosternum. A sternum may exist without ribs, or without forming any cartilaginous or osseous connection with ribs, as in the *Amphibia.* The plastron of Chelonians might well be supposed to be a great sternum, more especially as the plate-like ribs are connected with it. It appears, however, that this great complex plate does not really include a sternum.

Cranial Skeleton.—By the cranial skeleton we mean the skull, or that part of the axial skeleton which serves to shelter the brain (or anterior expanded end of the central part of the nervous system), together with solid structures continuous or more or less directly connected therewith. Such a structure exists in every Vertebrate animal, except the *Amphioxus*, which has no brain. Nothing of the kind is known to exist in any Ascidian or in any Invertebrate animal—unless that cartilage of Cuttlefishes, which serves as an investment of the nerve centers and a support for the optic and auditory organs, may be deemed a true cranial skeleton, since its portions just enumerated make it, as we shall shortly see, very analogous to a true skull.

The cranial skeleton is, of course, at first composed entirely of soft mesoblastic tissue, parts of which always become cartilaginous and generally also osseous, while more or less of its structure may remain in the condition of mere membrane. The bones which generally, as just said, enter into its framework may arise directly in the membrane or may be preceded by cartilage which ossifies, a circumstance which divides the cranial bones into two categories—"membrane bones" and "cartilage bones."

The cranial skeleton of Vertebrates is made up of three sets of parts:—(1) parts devoted to inclosing and protecting the brain; this is the cranium proper; (2) parts sheltering the organs of sense situated in the head—namely the optic, auditory, and olfactory capsules; these skeletal parts consist of the bones, cartilages, and membranes of the orbit, the internal ear, and the nose respectively, or the perioptic, periotic and perirhinal bones and cartilages; (3) parts continuous or more or less directly connected with the cranium, and applied to aid nutrition in the form of deglutition or respiration; such skeletal parts are the jaws and arches (or parts of such) behind the jaws known as the hyoidean and branchial arches.

In air-breathing Vertebrates the os hyoides consists of a central part or "body," to which are attached two pairs of single or jointed processes termed cornua. The anterior pair of cornua (known in human anatomy as the lesser cornua) represent the hyoidean arch, and may contain all its bones, including the "tympanohyal." The posterior pair of cornua (the greater cornua of human anatomy and the thyrohyals of Mammals generally) answer to or represent part of the branchial arches, and may be longer or shorter than the anterior pair of cornua. That they really have this homology is proved by the process of metamorphosis of the Tadpole, which in its early stage has distinct cartilaginous branchial arches that become the posterior cornua of the os hyoides of the adult Frog.

The osseous skull may, its bones remaining distinct, form a very solid whole, and the brain-case may be complete, as in Mammals, or it may be very loosely constructed and largely membraneous, as, *e.g.*, in most

Lizards. Teeth may be connected with various bones—most constantly with the dentary, maxillæ, and premaxillæ—but the palatines, pterygoids, parasphenoid (in *Plethodon*), pharyngo-branchials, and even the basioccipital (Carp and Tench), may be dentigerous.

The structure of the skull is so exceedingly complex and varied that it is impossible within the limits of the present article to do more than give the above general indications.

Appendicular Skeleton.—This part of the internal skeleton of Vertebrate animals normally supports two pairs of limbs only, but in one class—that of Fishes—there are azygous structures—the unpaired fins—which, as before said, must be reckoned as belonging to this category. The whole appendicular skeleton may, however, be wanting, as in the Lamprey and in most Serpents.

The Skeleton of the Paired Limbs.—The paired-limb skeleton normally consists of that of an anterior, pectoral, or thoracic pair of limbs and that of a posterior or pelvic pair. In certain species there may be but a single pair of limbs; which may either be the pectoral pair, as, *e.g.*, in the Amphibian genus *Siren*, or the pelvic pair, as in the Reptilian genera *Bipes*, *Lialis*, and *Ophiodes*.

Normally each pair consists of diverging appendages—the limb skeleton proper—attached to a solid structure embracing parts of the trunk, *i.e.*, a limb-root or limb-girdle. A thoracic limb-girdle may exist in a well-developed condition without any limbs attached to it—as in the Slow-Worm (*Anguis*), but there is never a well-developed pelvic girdle without a rudiment of a pelvic limb.

In all Vertebrates above Fishes the limbs are divisible into a main part of the limb—arm or leg—with a distal part or extremity—"manus" (hand) or "pes" (foot). We sometimes find (as in *Lialis*, *Python*, and *Balæna*) a rudimentary development of the skeleton of the leg without any rudiment of a pes; but we never find any rudimentary development of an arm without any rudiments of a manus. In the paired limb, as we have seen, a limb-girdle may be present without any part of a limb, but no part of the limb skeleton is ever developed without any limb-girdle. Normally the two limb-girdles are attached in a solid manner to the axial skeleton, in different modes.

Normally the pectoral girdle is only thus connected with the axial skeleton by its ventral part, or with the ventral part of that skeleton, *i.e.*, with the sternum, while it ends freely above, being dorsally connected with the axial skeleton only by soft structures. In Fishes, however, it may abut by its dorsal extremities on each side against the neural region of the spinal column, as in *Raia clavata*, or be connected with the head by skeletal structures, as in Bony Fishes, *e.g.*, Perch, Cod, etc.—having all the time no connection with the spine by its ventral part.

The pelvic girdle, on the contrary, is normally connected by its dorsal part solidly with the axial skeleton, though, as in Fishes, it may not be at all so connected. It never, however, abuts ventrally against the axial skeleton as does the thoracic girdle.

Nature and Origin of Appendicular Skeletal Parts.—From the researches of the late Professor Balfour it appears that the paired limbs arise as differentiations of continuous lateral folds or projections from the surface of the body, and the azygous fins arise as differentiated projections from its dorsal and ventral surfaces. Thus all these appendicular parts may be viewed as different species of one fundamental set of parts (pterygia), for the sum total of which the term "sympterygium" has been proposed. The paired limbs and azygous fins are of similar origin and nature. Separate narrow solid supports, in longitudinal series, and with their long axes directed more or less at right angles with the long axis of the body, were developed in varying extent in all these four folds or projections. These supports have, it would appear, very often united to form basal cartilages, the original single and united condition persisting in such forms as the ventral fin of *Polyodon* and the second dorsal of *Callorhynchus*, both already noticed.

The paired limbs are thus, in all probability, essentially peripheral structures which have become more or less closely connected with the axial skeleton. Their proximal parts uniting and growing inward have often become directly connected with parts of the axial skeleton. Thus the limb-girdles seem to have arisen—namely, as ingrowths from the basal cartilages of the limbs; and therefore the whole appendicular skeleton belongs to a different skeletal category from that of the head and spinal column or axial endoskeleton.

SKELTON, John, an eccentric English scholar and poet of the fifteenth century. Mr. Dyce, the editor of his works, fixes his birth about 1460. His first essay in verse was a poem after the manner of Lydgate on the death of Edward IV. (1483). He lived to pay compliments to Catherine, wife of Henry VIII., to jeer at the Scotch over the battle of Flodden, and to make fierce attacks on Wolsey, and is supposed to have died in 1529.

SKEPTICISM signifies etymologically a state of doubt or indecision in the face of different mutually conflicting statements (σκέπτομαι, I consider, reflect, hesitate, doubt). It is implied, moreover, that this doubt is not merely a stage in the road to certainty and true knowledge. The provisional suspense of judgment recommended by Descartes and others as the true beginning of philosophy is no more than a passing phase of the individual's mind in his search for truth. But the doubt of the skeptic is professedly the last result of investigation; it is the renunciation of the search for truth on the ground that truth or real knowledge is unattainable by man. An account of the chief historical appearances of skepticism and its different motives will serve to illustrate and amplify this statement, and will lead up to any further considerations of a general nature. At the outset, and in general terms, a skepticism may be summarily defined as a thorough-going impeachment of man's power to know—as a denial of the possibility of objective knowledge.

Trust, not distrust, is the primitive attitude of the mind. What is put before us, whether by the senses or by the statements of others, is instinctively accepted as a veracious report, till experience has proved the possibility of deception. In the history of philosophy, in the same way, affirmation precedes negation; dogmatism goes before skepticism. And this must be so, because the dogmatic systems are, as it were, the food of skepticism; without them it would be without motive, without a *basis operandi*. Accordingly, we find that skeptical thought did not make its appearance till a succession of positive theories as to the nature of the real, by their mutual inconsistency, had suggested the possibility that they might all alike be false. The Sophistic epoch of Greek philosophy was, in great part, such a negative reaction against the luxuriance of self-confident assertion in the nature-philosophies of the preceding age. Though skepticism as a definite school of opinion may be said, in accordance with old precedent, to date only from the time of Pyrrho of Elis, there can be no doubt that the main currents of Sophistic thought were skeptical in the wider sense of that term. The Sophists were the first in Greece to dissolve knowledge into individual and momentary opinion (Protagoras), or dialectically to deny the possibility of knowledge (Gorgias). Among the pre-Socratic nature-philosophers of Greece, Heraclitus and the Eleatics are the chief representatives of this polemic against the "lying witness" of the senses.

Still more unequivocal was the skeptical nihilism expressed by Gorgias in his three celebrated theses—(1) nothing exists; (2) if anything existed, it would be unknowable; (3) if anything existed and were knowable, the knowledge of it could not be communicated. The arguments of his book, "Concerning the Non-existent, or Nature," were drawn from the dialectic which the Eleatics had directed against the existence of the phenomenal world.

What Socrates chiefly did was to recreate the instinct for truth and the belief in the possibility of its attainment. The scientific impulse thus communicated was sufficient to drive skepticism into the background during the great age of Greek philosophy, (*i.e.*, the 100 years preceding Aristotle's death, 323 B.C.) The captious logic of the Megaric school—in which the Eleatic influence was strong—their devotion to eristics and elaboration of fallacies, was, indeed, in some cases closely related to skeptical results. The school has been considered with some truth to form a connecting link with the latter skepticism, just as the contemporary Cynicism and Cyrenaicism may be held to be imperfect preludes to Stoicism and Epicureanism.

The first man in antiquity whose skepticism gave name to his doctrine was Pyrrho of Elis, (about 360–270 B.C.) Zeller sums up Pyrrho's teaching in three propositions:—We know nothing about the nature of things; hence the right attitude toward them is to withhold judgment; the necessary result of withholding judgment is imperturbability. The Pyrrhonists were consistent enough to extend their doubt even to their own principle of doubt. They thus attempted to make their skepticism universal, and to escape the reproach of basing it upon a fresh dogmatism.

The skepticism of the New Academy (or, to speak more strictly, of the Middle Academy, under Arcesilaus and Carneades, founders respectively of the so-called second and third Academies) differed very little from that of the Pyrrhonists. The differences asserted by later writers are not borne out on investigation. But the attitude maintained by the Academics was chiefly that of a negative criticism of the views of others, in particular of the somewhat crude and imperious dogmatism of the Stoics. They also, in the absence of certainty, allowed a large scope to probability as a motive to action, and defended their doctrine on this point with greater care and skill. Arcesilas or Arcesilaus (about 315–240 B.C.) made the Stoic theory of irresistible impressions (φαντασίαι καταληπτικαί) the special object of his attack. Mere irresistibleness (κατάληψις), he maintained, is no criterion of truth, since false perceptions may equally possess this power to sway the mind. He seems chiefly to have supported his position by adducing the already well-known arguments of former philosophers against the veracity of the senses, and he evidently held that by these arguments the possibility of knowledge in general was sufficiently subverted. We can know nothing, he concluded—not even this itself, that we know nothing. The theory of Carneades (213–129 B.C.) represents the highest development of Academic skepticism. The dogmatic system which Carneades had in view was that of Chrysippus, the Stoic, whose main positions, whether in the theory of knowledge, in morals, or in theology, he subjected to an acute and thorough-going criticism. As to the criterion of truth, Carneades denied that this could be found in any impression, as such; for in order to prove its truth an impression must testify, not only to itself, but also to the objects causing it. We find, however, admittedly, that in many cases we are deceived by our impressions; and, if this is so, there is no kind of impression which can be regarded as guaranteeing its own truth.

The later skepticism—which is sometimes spoken of as the third skeptical school—claimed to be a continuation of the earlier Pyrrhonism. Ænesidemus, though not absolutely the first to renew this doctrine, is the first of whose doctrine anything is known. He appears to have taught in Alexandria about the beginning of the Christian era. Among the successors of Ænesidemus, the chief names are those of Agrippa, whose dates cannot be determined, and the physician Sextus Empiricus (about 200 A.D.), whose *Pyrrhonic Hypotyposes*, and his work *Adversus Mathematicos* constitute a vast armory of the weapons of ancient skepticism. They are of the utmost value as an historical record.

When we review the history of ancient thought, we find, as Zeller puts it, that "the general result of all skeptical inquiries lies in the proposition that every assertion may be opposed by another, and every reason by reasons equally strong—in the ἰσοσθένεια τῶν λόγων. Or, as the same thing may be expressed, what all skeptical proofs come back to is the relativity of all our ideas. We can never know the nature of things as they are, but always only the manner in which they appear to us. The criterion of the skeptic is the appearance. Not even his own proof can claim truth and universal validity: he does not assert; he only seeks to relate how a thing strikes him at the present moment. And even when he expresses his doubts in the form of universal statements they are intended to be included in the general uncertainty of knowledge."

One form of skepticism, however, may be claimed as an exclusively modern growth, namely, philosophical skepticism in the interests of theological faith. These skeptics are primarily Apologists. Their skepticism is not "de bonne foy;" it is simply a means to the attainment of a further end. They find that the dogmas of their church have often been attacked in the name of reason, and it may be that some of the objections urged have proved hard to rebut. Accordingly, in an access of pious rage, as it were, they turn upon reason to rend her. They deny her claim to pronounce upon such matters; they go further, and dispute her prerogative altogether. They endeavor to show that she is in contradiction with herself, even on matters non-theological, and that everywhere this much-vaunted reason of man (la superbe raison) is the creature of custom and circumstance. Thus the "imbecility" of reason becomes their warrant for the reception by another organ—by faith—of that to which reason had raised objections. It was not till toward the close of the Middle Ages that a sense of conflict between reason and revelation became widely prevalent and took shape in the essentially skeptical theory of the twofold nature of truth.

The typical and by far the greatest example of the Christian skeptic is Pascal (1623–1662). The form of the *Pensées* forbids the attempt to evolve from their detached utterances a completely coherent system. But what he everywhere emphatically denies is the possibility of reaching by the unassisted reason a satisfactory theory of things. The contradictions which meet us everywhere are summed up and concentrated in the nature of man. Man is a hopeless enigma to himself, till he sees himself in the light of revelation as a fallen creature. The fall alone explains at once the nobleness and the meanness of humanity; Jesus Christ is the only solution in which the baffled reason can rest. These are the two points on which Pascal's thought turns.

Passing from this particular vein of skeptical or semi-skeptical thought, we find, as we should expect, that the downfall of Scholasticism, and the conflict of philosophical theories and religious confessions which ensued, gave a decided impetus to skeptical reflection. One of the earliest instances of this spirit is afforded by the book of Agrippa of Nettesheim (1487–1535), *De Incertitudine et Vanitate Scientiarum.*

Hume, the most illustrious and indeed the typical skeptic of modern times, is treated at length in a separate article. Here, therefore, it is only necessary to point out shortly in what his skepticism consists. It is sometimes placed, as we have seen it is by Kant, in his distrust of our ability and right to pass beyond the empirical sphere. But the mere denial of the possibility of "divinity or school metaphysics," as we find it in the *Inquiry*, combined with an apparent confidence in "experimental reasoning concerning matter of fact and existence," does not constitute skepticism, but rather what would now be called agnosticism or positivism. It is essential to the skeptical position that reason be dethroned within experience as well as beyond it, and this is undoubtedly the result at which Hume arrives in his larger and more thorough-going work. More generally, therefore, his skepticism may be considered to lie in his relation to preceding philosophy.

The system of Kant, or rather that part of his system expounded in the *Critique of Pure Reason*, though expressly distinguished by its author from skepticism, has been included by many writers in their survey of skeptical theories. The difference between Kant, with his system of pure reason, and any of the thinkers we have passed in review is obvious; and his limitation of reason to the sphere of experience suggests in itself the title of agnostic or positivist rather than that of skeptic. Yet, if we go a little deeper, there is substantial justification for the view which treats agnosticism of the Kantian type as essentially skeptical in its foundations and in its results. For criticism not only limits our knowledge to a certain sphere, but denies that our knowledge within that sphere is real; we never know things as they actually are, but only as they appear to us. Our knowledge, in Kant's language, does not show us "the inward essence of the object in itself, but only the relation of the object to the subject."

Of a skepticism which professes to doubt the validity of every reasoning process and every operation of all our faculties it is, of course, as impossible as it would be absurd to offer any refutation. Here, as Butler incisively put it, "we can go no further. For it is ridiculous to attempt to prove the truth of those very perceptions whose truth we can no otherwise prove than by other perceptions of exactly the same kind with them, and which there is just the same ground to suspect, or to attempt to prove the truth of our faculties, which can no otherwise be proved than by means of those very suspected faculties themselves." This absolute skepticism, indeed, can hardly be regarded as more than empty words; the position which they would indicate is not one which has ever existed. In any case, such skepticism is at all times sufficiently refuted by the imperishable and justifiable trust of reason in itself. The real function of skepticism in the history of philosophy is relative to the dogmatism which it criticizes. And, as a matter of fact, it has been seen that many so-called skeptics were rather critics of the effete systems which they found cumbering the ground than actual doubters of the possibility of knowledge in general. And even when a thinker puts forward his doubt as absolute it does not follow that his successors are bound to regard it in the same light. The progress of thought may show it to be, in truth, relative, as when the nerve of Hume's skepticism is shown to be his thoroughgoing empiricism, or when the skepticism of the *Critique of Pure Reason* is traced to the unwarrantable assumption of things-in-themselves. When the assumptions on which it rests are proved to be baseless, the particular skepticism is also overcome. In like manner, the apparent antinomies on which such a skepticism builds will be found to resolve themselves for a system based on a deeper insight into the nature of things. The serious thinker will always repeat the words of Kant that, in itself, skepticism is "not a permanent resting-place for human reason." Its justification is relative and its function transitional.

SKIMMER, the English name bestowed by Pennant in 1781 on a North-American bird which had already been figured and described by Catesby as the "Cut-Water"—as it appears still to be called on some parts of the coast—remarkable for the unique formation of its bill, in which the maxilla, or so-called upper mandible, is capable of much vertical movement, while the lower mandible, which is considerably the longer of the two, is laterally compressed, so as to be as thin as a knife-blade. This bird is the *Rhynchops migra* of Linnæus, who, however, united with it what proves to be an allied species from India that, having been indicated many years before by Petiver, on the authority of Buckley, was only technically named and described in 1838 by Swainson as *R. albicollis.*

SKIN DISEASES. These form a large and important class. In number they are very extensive, owing to the varied forms of morbid change which the skin texture may undergo, no less than to the different portions of the structure and its appendages which may be specially affected. Further, the modifications of the typical forms of these diseases which are to be observed have led to arrangements and classifications of very complex character and multiplied greatly their nomenclature. Skin diseases are regarded by the physician as of great importance, not only from the fact that morbid action in this texture must have a powerful influence on the general health and may bring in its train other maladies, but also because they are not infrequently themselves the expression of constitutional conditions, inherited or acquired, the recognition of which is essential to their effectual treatment. In order to clearness of description it is necessary to make use of some method of classification. Various arrangements have been adopted by writers on the subject, but the following appears sufficient for the present purpose:

I. Disorders of the secreting apparatus (of the sebaceous and sweat glands);

II. Disorders specially relating to nutrition (hypertrophies; atrophies; new formations; pigmentary changes);

III. Inflammatory affections (erythematous; papular; vesicular; pustular; squamous or scaly);

IV. Neuroses (nervous disorders);

V. Parasitic affections (animal; vegetable).

I. DISORDERS OF THE SECRETING APPARATUS.—(1) *Of the Sweat Glands.*—The chief morbid conditions are excessive sweating (*hyperidrosis*) and fetid sweating (*bromidrosis*). Some persons habitually perspire, often to a great extent on making any effort, yet never appear to suffer in health, although the discomfort is considerable. Excessive perspiration may often be prevented by the habitual use of the cold bath, and by tonics, such as iron, quinine, strychnia, etc. Locally, the use of astringent lotions of vinegar or a weak solution of lead will also be of service. Bromidrosis is apparently due to rapid decomposition in the perspiration which has saturated the stockings, and for its treatment it is essential that these should be frequently changed and the feet washed several times a day, dried carefully, and dusted with some antiseptic powder, such as boracic or salicylic acid mixed with starch or French chalk. Hebra recommends the application to the feet of a composition of equal parts of olive oil and litharge plaster spread upon linen and used twice a day.

(2) *Of the Sebaceous Glands.—Seborrhœa* is a term applied to describe an accumulation on the skin of the normal sebaceous secretion mixed up with dirt and forming scales or a distinct incrustation. This affection may to a large extent be prevented by strict attention to ablution and brisk friction of the skin, which will also often remove them when they begin to appear. The retained secretion may be squeezed out or evacuated by incision and the skin treated with some simple sulphur application.

Acne is an eruption produced by inflammation of the sebaceous glands and hair follicles. A variety of this malady, to which the name *acne rosacea* is given, is a more severe and troublesome disorder than that already mentioned. It is characterized by great redness of the nose and cheeks, accompanied with nodular enlargements on the surface of the skin, which produce marked disfigurement. Although often seen in persons who live too freely, it is by no means confined to such, but may arise in connection with disturbances of the general health, especially of the function of digestion, and in females with menstrual disorders. It is apt to be exceedingly intractable to treatment, which is partly local and partly constitutional. Of internal remedies preparations of iodine and of arsenic are sometimes found of service.

Molluscum contagiosum belongs to this class of skin diseases. It consists of an enlargement of the sebaceous glands and occlusion of the ducts, and is seen most commonly on the face, body, or hands in children, or on the breasts in women. It is said to be contagious, but it is a rare form of skin disease.

II. DISORDERS AFFECTING NUTRITION.—(1) *Hypertrophies.*—A *corn* (*clavus*) is a local thickening of the skin, generally occurring on the toes. The treatment consists in maceration of the hardened skin and the use of the knife or strong caustics. Salicylic acid combined with ether and collodion, painted over the part, is said to be useful in the case of soft corns.

A *wart* (*verruca*) is an excrescence from the surface of the skin due to hypertrophy of the papillary layer of the cutis and of the epidermis. This form of growth may also occur on mucous membranes. Warts occasionally disappear spontaneously, or they may be excised, or carefully touched with some strong caustic acid or alkali.

Ichthyosis or *xeroderma* consists of a general thickening of the whole skin and marked accumulation of the epidermic elements, with atrophy of the sebaceous glands, giving rise to a hard, dry, scaly condition. It generally first appears in infancy, and is probably congenital. It differs in intensity and in distribution in different cases, and is generally little amenable to any but palliative remedies, such as the regular application of oily substances, although it is not a fatal malady.

For *elephantiasis Arabum*, see ELEPHANTIASIS.

(2) *Atrophies.*—The chief of these relate to the hair. *Canities* or whitening of the hair consists in the nonformation of the pigmentary matter which is normally present in the substance of the hair, and occurs generally as a slow senile change. It may, however, take place prematurely, in which case it is often hereditary; or it may be associated with degenerative changes taking place in the system. It is occasionally seen to occur temporarily in very young persons in connection with some defective condition of the general health. Its development suddenly has not infrequently been observed as the result of some strong mental emotion.

Alopecia, or baldness, is the loss of hair, which is most commonly a senile change and irremediable, or on the other hand may be premature, occurring either hereditarily or in connection with some previous constitutional morbid state (*e.g.*, after fevers or other blood poisons), in which latter case it may be only, although not always, temporary. The treatment of temporary or premature baldness bears reference especially to any known conditions affecting the general health; and tonics, baths, and other means to promote a vigorous skin function are useful. Stimulating liniments containing spirits and cantharides, the regular cleansing and moderate brushing of the parts, the application to the scalp of the constant current of electricity, and various other remedies appear to be of service in promoting the growth of hair.

(3) *New Formations.—Lupus* is a disease characterized by the formation in the skin of tubercles or nodules consisting of new cell growth which has no tendency to further development, but to retrograde change, leading to ulceration and destruction of the skin and other tissues in which it exists, and the subsequent formation of permanent white scars. *Lupus vulgaris* is most commonly seen in early life, and occurs chiefly on the face, about the nose, cheeks, ears, etc., but it may also affect the skin of the body or limbs. Lupus is generally more frequently seen in women than in men, and it is held to be connected with a scrofulous constitution. Its treatment bears reference especially to this condition (see SCROFULA). In the superficial variety the application of soothing ointments when there is much redness, and Squire's method of slight linear incisions to destroy the increased blood supply, are often serviceable.

(4) *Pigmentary Changes.—Chloasma* is an abnormal pigmentation, in the form of brown patches, either generally diffused or confined to one part, such as the forehead and face, and occasionally seen in women suffering from uterine ailments. *Addison's disease* is connected with a morbid condition of the suprarenal capsules, and is accompanied with general bronzing of the skin, together with anæmia and great and increasing prostration. *Leucoderma* is a change in the pigmentation of the skin, whereby it becomes white in patches, with a tendency to spread and affect almost the whole surface, until a few dark areas alone remain to represent the original appearance of the skin. It is sometimes called white leprosy, but has no relation to that disease, nor is it of any special significance as regards the health. *Albinism* is an entire absence of pigment from the hair, skin, eyes, etc. The hair is usually white, and the skin exceedingly pale; and the eye has a pinkish appearance. This condition is congenital. It occasionally exists to a partial extent in any of the textures named.

III. INFLAMMATORY SKIN AFFECTIONS.—These embrace the following chief varieties—(1) diffuse (erythema); (2) papular (lichen); (3) catarrhal (eczema); (4) vesicular (herpes, pemphigus); (5) pustular (impetigo); and (6) scaly (psoriasis, pityriasis).

(1) *Diffuse.*—This variety includes *erythema* (see ERYSIPELAS) and its forms, particularly *erythema nodosum*, which consists of spots and patches of dark red color and slightly elevated, appearing on the front of the legs and back of the arms in young persons, mostly females. The patches continue for a number of days and then become fainter. It is supposed to be connected with rheumatism, joint pains not infrequently

accompanying it. *Urticaria* or *nettle-rash* is a diffuse redness of the skin, accompanied with wheals of raised and paler appearance, not unlike the effect produced by the sting of nettles or of insects, and attended with great irritation and itching. Certain kinds of food, such as fruit and fish, produce this eruption in some persons, as also some drugs, such as opium. It is best treated by some soothing application, such as a solution of sal volatile, to which a little chloral has been added, and by attention to the state of the alimentary canal. *Roseola*, which consists in the appearance of rose-colored spots upon the body, is frequently seen in children, and is apt to be mistaken for measles, but has none of the accompanying febrile or catarrhal symptoms of that disorder, and is of brief duration.

(2) *Papular.—Lichen*, an eruption consisting of small, thickly-set, and slightly-elevated red points, more or less widely distributed over the body, and in the young somewhat resembling scarlet fever, but with only slight febrile symptoms and no sore throat, usually results from digestive derangements, but apparently may also arise from exposure to the sun, and it lasts but a short time. Some forms, however (*e.g. lichen ruber*), are of chronic character and difficult of treatment. The ordinary form requires little beyond attention to the digestive organs and the application of a soothing lotion or powder. The chronic forms are best treated by the administration of arsenic. *Strophulus*, or tooth-rash, or as it is popularly termed, "red gum," an affection very common in young infants, belongs to this class of skin disorders.

(3) *Catarrhal.—Eczema*, one of the most common and important of all skin diseases, consists of an inflammation of the true skin, of catarrhal character, together with the formation of papules, vesicles, or pustules, attended with more or less discharge, and with itching and other symptoms of irritation. It may be either acute or chronic, and presents itself in a variety of forms. The treatment of chronic eczema depends in great measure upon the form it assumes. Where there exists much irritation, soothing lotions or applications similar to those required for acute eczema are necessary; but where irritation has subsided, stimulating ointments, such as those of zinc or white precipitate, are often of service. Constitutional remedies, such as iron, arsenic, etc., are an important and often essential part of successful treatment.

(4) *Vesicular.—Herpes* is an inflammation of the true skin, attended with the formation of isolated or grouped vesicles of various sizes upon a reddened base. They contain a clear fluid, and either rupture or dry up. The most that can be done for its relief is to protect the parts with cotton wool or some dusting powder, while the pain may be allayed by opiates or bromide of potassium. Quinine internally is often of service.

Pemphigus consists in large blebs upon a red base. They contain a clear or yellowish fluid. This disease appears to show itself most frequently on the bodies and limbs of unhealthy or neglected children. The treatment is mainly constitutional—by good nourishment, iron, etc.

(5) *Pustular.—Impetigo*, consisting of small pustules situated upon a reddened base, mostly occurs in children. There appears to be a contagious form of this malady. *Ecthyma* consists of large pustules of similar character on the body and limbs. The treatment of these ailments requires special attention to nutrition, since they usually occur in low states of health.

(6) *Squamous or Scaly.—Psoriasis*, an inflammatory affection of the true skin, attended with the formation of red spots or patches, which are covered with white silvery scales, may affect any portion of the surface of the body, but is most common about the elbows and knees, and on the head. The disease appears to be consistent with continued good health. It is usually obstinate to treat, and may, with intervals of comparative immunity, last a lifetime. The remedies most serviceable are arsenic internally, and the application externally of preparations of tar. Recently the employment of chrysophanic acid as an ointment or in solution, has been resorted to with considerable success.

Pityriasis, a superficial inflammation of the skin, with the formation of minute branny scales, occurs most commonly on the head, and is of chronic duration. The remedies most useful are alkaline lotions and tar preparations. A variety of this disease (*pityriasis rubra*) affects the whole body, and is most intractable to treatment.

IV. NEUROSES (*Nervous Affections*).—Various disorders of nutrition of the skin occur in persons suffering from organic nervous diseases, such as bedsores, atrophic changes, eruptions, etc., but these belong to the symptoms of the several diseases with which they are associated. The most common of the neuroses of the skin is probably *pruritus*, which is an ailment characterized by intense itching of the surface of the body. The treatment consists in the removal of any apparent cause, and measures to strengthen the system, such as the use of quinine, iron, etc. Soothing lotions composed of solutions of alkalis conjoined with chloral, opium, hydrocyanic acid, etc., may be applied to the affected skin at bedtime.

V. PARASITIC DISEASES.—(1) *Animal.*—The following are the chief animal parasitic diseases. *Phthiriasis* is produced by the presence of lice (*pediculi*), of which there are three varieties, infesting respectively the head, body, and pubis. The cause is in most instances uncleanliness, but occasionally in the aged, and in persons suffering from chronic diseases, there appears to be a liability to the development of pediculi, notwithstanding every care to prevent it. The irritation produced by the parasite and the scratching thus occasioned may give rise to abrasions of the skin and eczematous conditions. The treatment consists in thorough cleansing of the parts and the use of parasiticides, such as red or white precipitate, carbolic lotions (one in twenty), or a decoction or ointment of stavesacre.

(2) *Vegetable parasites* consist of fungous growths in the texture of the skin and hair, which are characterized microscopically by minute round bodies or spores often coalesced into clusters or bead-like arrangements, and jointed filaments or *mycelium* of elongate and branching form. They are readily detected by removing a hair, or scraping a portion of the affected skin, treating it with a strong alkaline solution, and submitting it to microscopic examination, by which the slight differences in form and arrangement of the varieties of the parasite can be easily made out. The common name "tinea" is applied to these parasitic affections. It is often extremely obstinate to treatment, and numerous agents have been proposed as specifics, not one of which, however, appears to possess infallible virtues. Among the best are oleate of mercury (5 to 10 per cent.) and other mercurial preparations, all which, however, must be used with care, and carbolic or sulphurous acid with glycerine, iodine, cantharides, etc.; but isolation of the patient as far as possible, together with strict medical supervision, is essential for the effectual treatment of this disorder.

SKINNER, JOHN, author of *Tullochgorum* and *The Ewie wi' the Crookit Horn*, was an Episcopalian minister in the parish of Longside, Aberdeenshire. He held this charge for more than sixty-four years. The son of an Aberdeenshire schoolmaster, born at Balfour in 1721, he had been intended for the Presbyterian ministry, but, after passing through Marischal College, Aberdeen, and teaching for a few years, he took orders in the Episcopal Church, and was appointed to the charge of Longside in 1742. It is by his songs, limited in quantity, but some of them of the very highest quality, that Skinner is generally known. His best songs had stolen into print; a collection was not published till 1809, under the title of *Amusements of Leisure Hours.* He published in 1788 an *Ecclesiastical History of Scotland*, in the form of letters; and other works in the same form, which best suited his easy unaffected strength, were collected and published by his son after his death (June, 1807), having previously had a wide circulation in manuscript.

SKIPTON, an ancient market-town in the West Riding of Yorkshire, England, is situated on the river Aire, on the Leeds and Liverpool canal, and on the Midland railway, nine miles northwest of Keighley and fifteen southeast of Settle. The town has a considerable general trade. The population of the urban sanitary district (area 4,245 acres) in 1871 was 6,078, and in 1881 it was 9,091.

SKITTLES. This English game, which somewhat resembles American bowls, was formerly known as *Kails* (Fr., *quilles*), and first came into vogue in England in the fourteenth century. Nine large oval-headed pins with flat bottoms, and made of a hard wood, are set up on a wooden frame, three pins square on each side. An angle and not an even side of the said square is presented toward the player, who stands at the distance of twenty-one feet. There may be one or two players a-side; and the object of each side is to knock down, or "floor," the greatest number of pins in the least possible number of throws, which are generally two or three, though they may extend to five, according to agreement. The roundish ball used for throwing weighs from eight to fourteen pounds, and in fair playing only one step forward is allowed in delivery.

SKOWHEGAN, a village of Maine and the county seat of Somerset county, is situated on both sides of the Kennebec river and at the terminus of the western branch of the Maine Central railroad. At this point the Kennebec river has a perpendicular fall of more than twenty-five feet, and furnishes valuable water power to the manufacturing industries carried on, which embrace lumber, sash, doors and blinds, oil-cloth, dress goods, woolen mats, boots and shoes, potash, fiber wire, scythes, hammers, hatchets, hardware specialties, etc. The city contains three banks, one or more weekly papers, a court-house, public hall, eight churches, an academy and high school, several hotels and many stores. The population in 1890 (estimated) was 5,000.

SKUA, the name for a long while given to certain of the *Laridæ*, which sufficiently differ in structure, appearance and habits to justify their separation as a distinct genus, *Stercorarius* (*Lestris* of some writers), or even Subfamily, *Stercorariinæ.* Swift of flight, powerfully armed, but above all endowed with extraordinary courage, they pursue their weaker cousins, making the latter disgorge their already-swallowed prey, which is nimbly caught before it reaches the water.

SKUNK. The existence of the animal to which this name is applied was first notified to European naturalists as long ago as 1636, in Gabriel Sagard-Theodat's *History of Canada*, where, in commencing his quaint account of it (p. 748), he describes it as "enfans du diable, que les Hurons appelle Scangaresse, * * * une beste fort puante," etc. (a child of the devil, which the Hurons call Scangaresse—a beast of powerful scent).

The common skunk (*Mephitis mephitica*) is a native of North America, extending from Hudson's Bay southward to Guatemala in Central America. Three species are known, two of them commonly found together in the southwest. The body is long and arched upward, the legs short, feet semi-plantigrade, tail very long and bushy. Of the two kinds most common the larger may be parti-colored or entirely black. The smaller, which is about the size of a cat, is usually marked by irregular longitudinal white stripes, one on each side.

The remarkable and overpowering odor is not the mere smell of the animal itself, but arises from the much-modified secretion of the anal glands. These glands, although present in all *Mustelidæ*, are especially developed in the skunks, and are peculiar for being so entirely under the control of the animal that at ordinary times, as Doctor Merriam has stated, the animal is enabled to be both cleanly and free from smell. The glands which secrete the odoriferous fluid are modifications of the ordinary anal glands possessed by nearly all *Carnivora*, but in the skunks they are enormously enlarged, entirely surround the rectum, and are provided with thick muscular gizzard-like coats. The two ducts leading from these glands open at the tips of two small conical papillæ placed just inside the anus, in such a position that by everting the anus the animal can protrude them externally, and with them can guide the direction of the jet of nauseous fluid, which is often propelled by the powerful muscles surrounding the glands to a distance of from eight to twelve feet.

SKVIRA, a district town of European Russia, in the government of Kieff, seventy-seven miles southwest of Kieff, and twenty-seven miles from the Fastova railway-junction. It is merely a big village, with 14,200 inhabitants, mostly engaged in agriculture.

SKYE, the largest island of the Inner Hebrides, Scotland, is situated between the mainland of Inverness-shire, within which county it is included, and the group of the Outer Hebrides. It lies between 57° 1′ 12″ and 57° 42′ 30″ N. latitude, and 5° 38′ 50″ and 6° 47′ 8″ W. longitude. It is separated from the mainland at its eastern corner by Loch Alsh and Kyle Rhea, the channel at the narrowest point having a breadth of only about three furlongs.

On account of the damp climate the land is better adapted for rearing sheep and cattle than for tillage. A large number of cattle of the West Highland breed are grazed on the moors. The sheep are principally black-faced, but some Cheviots are also kept. The greater portion of the inhabitants are crofters, who inhabit chiefly miserable huts with a fireplace in the middle of the floor, the smoke escaping by a hole in the roof. The number of crofts in Skye, according to the report of the Crofters' Commission 1884, was 2,051. The number of families ejected by decrees from their holdings between 1840 and 1860 was 5,012, representing a population of 25,060, and between 1860 and 1883 1,948, representing a population of 9,740.

SLANDER. See LIBEL.

SLATE is an argillaceous rock of various colors—blue, green, purple, gray, and black—and of a peculiar structure by which it readily splits into thin plates or laminæ. It is of sedimentary origin, being primarily deposited on ocean floors as fine mud formed by the waste and denudation of preëxisting rocks, and afterward compressed, hardened, and altered into compact rock. Slate beds occur mainly in the Cambrian, Silurian, and Devonian formations—frequently alternating with bands of grit and limestone, or interstratified with feldspathic lava or ashes—and, being tilted up from their original horizontal or nearly horizontal position, stretch across wide districts in a series of undulations, which rise to the surface in crests, or dip into troughs underground and form angles of every inclination with the horizon.

Several varieties of clay slate are met with, and are characterized by the mineral that chiefly prevails. The color—varying shades of blue, green, and purple being the most common—depends mainly on the presence of iron and the form in which it exists. The common roofing slate of commerce is generally fine-grained, and combines great strength and durability with moderate weight. It is also very dense, one cubic foot weighing over 170 pounds, while according to Mr. Wilkinson it takes on an average 20,000 pounds to crush one cubic inch.

Slate has been used for roofing during many centuries, and it is said that some of the old castles of North Wales—such as Carnarvon and Conway—were covered with this material.

Slate is now almost universally used for roofing houses and buildings of every description, and for such purposes it is unequaled, the better sorts possessing all the qualities necessary for protection against wind, rain, and storm. The finer varieties are made into writing slates, and in districts where cross cleavage exists slate pencils are made. Slabs are also manufactured, and, being readily cut, planed, dressed, and enameled, are used for chimney pieces, billiard tables, wall linings, cisterns, paving, tombstones, ridge rolls, and various other architectural and industrial purposes.

SLAUGHTER HOUSE. See ABATTOIR.

SLAVERY. It appears to be true that, in the words of Dunoyer, the economic régime of every society which has recently become sedentary is founded on the slavery of the industrial professions. In the hunter period the savage warrior does not enslave his vanquished enemy, but slays him; the women of a conquered tribe he may, however, carry off and appropriate as wives or as servants, for in this period domestic labor falls almost altogether on their sex. In the pastoral stage slaves will be captured only to be sold, with the exception of a few who may be required for the care of flocks or the small amount of cultivation which is then undertaken. It is in proportion as a sedentary life prevails, and agricultural exploitation is practiced on a larger scale, while warlike habits continue to exist, that the labor of slaves is increasingly introduced to provide food for the master, and at the same time save him from irksome toil. Of this stage in the social movement slavery seems to have been, as we have said, a universal and inevitable accompaniment.

It was in the Roman state that military action—in Greece often purposeless and, except in the resistance to Persia, on the whole fruitless—worked out the social mission which formed its true justification. Hence at Rome slavery also most properly found its place, so long as that mission was in progress of accomplishment. As soon as the march of conquest had reached its natural limit, slavery began to be modified; and when the empire was divided into the several states which had grown up under it, and the system of defense characteristic of the Middle Ages was substituted for the aggressive system of antiquity, slavery gradually disappeared, and was replaced by serfdom, which again, with the rise of modern industrial life, gave way to personal freedom.

We proceed to a closer study of the institution of slavery as it existed in the Greek and Roman societies respectively.

We find it already fully established in the Homeric period. The prisoners taken in war are retained as slaves, or sold or held at ransom by the captor. Sometimes the men of a conquered town or district are slain and the women carried off. Not infrequently free persons were kidnaped by pirates and sold in other regions, like Eumæus in the *Odyssey*. The slave might thus be by birth of equal rank with his master, who knew that the same fate might befall himself or some of the members of his family. The institution does not present itself in a very harsh form in Homer, especially if we consider (as Grote suggests) that "all classes were much on a level in taste, sentiment, and instruction." The male slaves were employed in the tillage of the land and the tending of cattle, and the females in domestic work and household manufactures. The principal slaves often enjoyed the confidence of their masters and had important duties intrusted to them; and, after lengthened and meritorious service, were put in possession of a house and property of their own. Grote's idea that the women slaves were in a more pitiable condition than the males does not seem justified, except perhaps in the case of the *aletrides*, who turned the household mills which ground the flour consumed in the family, and who were sometimes overworked by unfeeling masters. Part of the agricultural work was sometimes done by poor hired freemen (*thetes*), who are spoken of as a wretched class, and were perhaps employed almost exclusively by the smaller landholders. Having no powerful protector to whom they could look up, and depending on casual jobs, they were probably in a less desirable position than the average slave. Homer conceives the lot of the latter as a bitter one; but it must be remembered that the element of change from a former elevated position usually enters into his descriptions. He marks in a celebrated couplet his sense of the moral deterioration commonly wrought by the condition of slavery.

It is, however, in historic Greece, where we have ample documentary information, that it is most important to study the system of slavery—and especially at Athens, where the principal work of Greek civilization found its accomplishment. The case of Sparta, in some respects peculiar, must be separately considered.

The sources of slavery in Greece were:—1. Birth, the condition being hereditary. 2. Sale of children by their free parents, which was tolerated, except in Attica, or their exposure, which was permitted, except at Thebes. 3. Capture in war. 4. Piracy and kidnapping. 5. Commerce.

The slaves were employed either in domestic service—as household managers, attendants or personal escorts—or in work of other kinds agricultural or urban.

The number of slaves in Greece, or even at Athens, can scarcely be determined with any tolerable approach to certainty. It is stated by Athenæus, on the authority of Ctesicles, that the census of Demetrius Phalereus gave for Athens 21,000 citizens, 10,000 metics (resident foreigners), and 400,000 slaves. It is also stated by the same author that Corinth had possessed 460,000 slaves and Ægina 470,000.

The slave could purchase his liberty with his peculium by agreement with his master. He could be liberated by will, or, during his master's life, by proclamation in the theater, the law courts, or other public places, or by having his name inscribed in the public registers, or, in the later age of Greece, by sale or donation to certain temples—an act which did not make the slave a hierodule but a freeman. Conditions were sometimes attached to emancipation, as of remaining for life or a definite time with the former master, or another person named by him, or of performing some special service; payments or rights of succession to property might also be reserved.

We have already observed that the Roman system of life was that in which slavery had its most natural and relatively legitimate place; and accordingly it was at Rome that, as Blair has remarked, the institution was more than anywhere else "extended in its operation and methodized in its details." Not only on this ground is it especially deserving of our study, but because out of the slave-class, as it was organized by the Romans in the countries subject to the empire, the modern proletariat has been historically evolved.

We must distinguish from the later slavery at Rome what Mommsen calls "the old, in some measure innocent" slavery, under which the farmer tilled the land along with his slave, or, if he possessed more land than he could manage, placed the slave—either as a steward, or as a sort of lessee obliged to render up a portion of the produce—over a detached farm. Though slaves were obtained by the early victories of Rome over her Italian neighbors, no large number was employed on the small holdings of those periods. But the extension of properties in the hands of the patricians, and the continual absences of citizens required by the expanding system of conquest, necessarily brought with them a demand for slave labor, which was increasingly supplied by captives taken in war. Of the number furnished from this source a few particulars from the time of the mature republic and the first century of the empire will give some idea. In Epirus, after the victories of Æmilius Paullus, 150,000 captives were sold. The prisoners at Aquæ Sextiæ and Vercellæ were 90,000 Teutons and 60,000 Cimbri. Cæsar sold on a single occasion in Gaul 63,000 captives; Augustus made 44,000 prisoners in the country of the Salassi; after immense numbers had perished by famine and hardship and in the combats of the arena, 97,000 slaves were acquired by the Jewish war.

There were other sources from which slavery was alimented, though of course in a much less degree. Certain offenses reduced the guilty persons to slavery (*servi pœnæ*), and they were employed in public work in the quarries or the mines. Originally, a father could sell his children. A creditor could hold his insolvent debtor as a slave, or sell him out of the city (*trans Tiberim*). The enslavement of debtors, overwhelmed with usury in consequence of losses by hostile raids or their own absence on military service, led to the revolt of the Mons Sacer (493 B.C.) The Pœtelian law (326 B.C.) restricted the creditor's lien (by virtue of a *nexum*) to the goods of his debtor, and enacted that for the future no debtor should be put in chains; but we hear of debtors *addicti* to their creditors by the tribunals long after—even in the time of the Punic Wars.

There were *servi publici* as well as *privati*. The service of the magistrates was at first in the hands of freemen; but the lower offices, as of couriers, servants of the law courts, of prisons, and of temples, were afterward filled by slaves. The execution of public works also came to be largely committed to them—as the construction of roads, the cleansing of the sewers, and the maintenance of the aqueducts. Both kinds of functions were discharged by slaves, not only at Rome, but in the rural and provincial municipalities. The slaves of a private Roman were divided between the *familia rustica* and the *familia urbana*. At the head of the *familia rustica* was the *villicus*, himself a slave, with the wife who was given him at once to aid him and to bind him to his duties. Under him were the several groups employed in the different branches of the exploitation and the care of the cattle and flocks, as well as those who kept or prepared the food, clothing, and tools of the whole staff, and those who attended on the master in the various species of rural sports. A slave prison (*ergastulum*) was part of such an establishment, and there were slaves whose office it was to punish the offenses of their fellows. To the *familia urbana* belonged those who discharged the duties of domestic attendance, the service of the toilet, of the bath, of the table, of the kitchen, besides the entertainment of the master and his guests by dancing, singing, and other arts.

As to the numbers of slaves belonging to individual masters, though we have no distinct general statement in the Roman writers, several special examples and other indirect indications serve to show that the wealthier men possessed very large *familiæ*. This may be inferred from the *columbaria* of the house of Livia, and of other great houses.

By the original Roman law the master was clothed with absolute dominion over the slave, extending to the power of life and death. The slave could not possess property of any kind; whatever he acquired was legally his master's. He was, however, in practice permitted to enjoy and accumulate chance earnings or savings, or a share of what he produced, under the name of *peculium*. A master could not enter into a contract with his slave, nor could he accuse him of theft before the law; for, if the slave took anything, this was not a subtraction, but only a displacement, of property. The union of a male and female slave had not the legal character of a marriage; it was a cohabitation (*contubernium*) merely, which was tolerated, and might be terminated at will by the master; a slave was, therefore, not capable of the crime of adultery. Yet general sentiment seems to have given a stronger sanction to this sort of connection; the names of husband and wife are freely used in relation to slaves on the stage, and even in the laws, and in the language of the tombs. For entering the military service or taking on him any state office a slave was punished with death. He could not in general be examined as a witness except by torture. A master, when accused, could offer his slaves for the "question," or demand for the same purpose the slaves of another; and, if in the latter case they were injured or killed in the process, their owner was indemnified. A slave could not accuse his master, except of adultery or incest (under the latter name being included the violation of sacred things or places); the case of high treason was afterward added to these. An accused slave could not invoke the aid of the tribunes. The penalties of the law for crime were more severe on guilty slaves than on freemen; "majores nostri," say the legists, "in omni supplicio severius servos quam liberos punierunt." The capital punishment of the freeman was by the sword or the precipice, of the slave by the ax or the cross. The lex Cornelia punished the murder of a slave or a freeman alike; but the master who killed his own slave was not affected by this law.

Blair, in comparing the Greek and Roman systems of slavery, points with justice to the greater facility and frequency of emancipation as the great superiority of the latter. No Roman slave, he says, "needed to despair of becoming both a freeman and a citizen." Manumission was of two kinds—*justa* or regular, and *minus justa*. Of *manumissio justa* there were four modes—(1) by adoption, rarely resorted to; (2) by testament, already recognized in the Twelve Tables; (3) by *census*, which was of exceptional use, and did not exist later than the time of Vespasian; and (4) by *vindicta*, which was the usual form. In the last method the master turned the slave round with the words "liber esto," in the presence of the prætor, that officer or his lictor, at the same time striking the slave with his rod. The *manumissio minus justa* was effected by a sufficient manifestation of the will of the master, as by letter, by words, by putting the *pileus* (or cap of liberty) on the slave, or by any other formality which had by usage become significant of the intention to liberate, or by such an act as making the slave the guardian of his children. This extra-legal sort of manumission was incomplete and precarious; even after the lex Julia Norbana (19 A.D.), which assimilated the position of those so liberated, to that of the Latin colonists, under the name of Latini juniores, the person remained in the eye of the law a slave till his death and could not dispose of his peculium.

The slavery of the working classes, justly described by Hume as the most important difference between the social life of antiquity and that of modern times, was not directly changed into the system of personal freedom. There was an intermediate stage which has not always been sufficiently discriminated from slavery, though the confusion of the two leads to endless misconceptions. We mean the régime of serfdom.

While ancient slavery was a system fitted to endure under given social conditions, and had a definite political function to fulfill, serfdom, which succeeded when that function was exhausted, was a merely transitory condition, with no other destination than that of leading the working population up to a state of entire personal freedom. How the serf in cities and towns became a free laborer for hire can be easily conceived; he doubtless in many cases purchased his liberty out of his earnings, and in others it was not the master's interest to retain his services at the cost of his maintenance. The emancipation of this entire class was favored by the movement (not, however, to be confounded with it) which established free industrial communities and gave them municipal jurisdiction. But it is very difficult to trace the steps by which the rural serf was transmuted into a free tenant. "The time and manner," says Adam Smith, "in which so important a revolution was brought about is one of the most obscure points in modern history." Smith himself attributes the change to two causes—(1) the greater advantage to the proprietor derived from the exertions of the cultivator when he worked entirely for himself, and (2) the encouragement which sovereigns, jealous of the great lords, gave to the villeins (under which term Smith seems to comprehend the whole mixed class of non-free tenants) to encroach on their authority. To these economic and political reasons, though doubtless real and important, Smith appears to attribute too exclusive an efficacy; neglecting the moral and religious causes which conspired to the same result, especially the personal influence of the clergy, who were natural mediators between the serfs and the proprietors. The serfs were best treated on the ecclesiastical estates, and many on private properties were liberated "pro amore Dei" and "pro remedio animæ."

By gradual processes every form of servitude disappeared from the social order of western Europe, while at the same time was bequeathed to the modern world the inexorable problem, still but partially solved, of the definitive position of the classes whose origin is traceable to that condition.

But not very long after the disappearance of serfdom in the most advanced communities comes into sight the new system of colonial slavery, which, instead of being the spontaneous outgrowth of social necessities and subserving a temporary need of human development, was politically as well as morally a monstrous aberration, and never produced anything but evil.

In 1442, when the Portuguese under Prince Henry the Navigator were exploring the Atlantic coast of Africa, one of his officers, Antam Gonsalves, who had captured some Moors, was directed by the prince to carry them back to Africa. He received from the Moors in exchange for them ten blacks and a quantity of gold dust. This excited the cupidity of his fellow-countrymen; and they fitted out a large number of ships for the trade, and built several forts on the African coast. Many negroes were brought into Spain from these Portuguese settlements, and the colonial slave trade first appears in the form of the introduction into the newly-discovered western world of children or descendants of these negroes. When Ovando was sent out in 1502 as governor of Hispaniola, while regulations, destined to prove illusory, were made for the protection of the natives of the island, permission was given to carry to the colony negro slaves, born in Seville and other parts of Spain, who had been instructed in the Christian faith. It appears from a letter of Ovando in 1503 that there were at that time numbers of negroes in Hispaniola; he requested that no more might be permitted to be brought out. In 1510 and the following years King Ferdinand ordered a number of Africans to be sent to that colony for the working of the mines.

The first Englishman who engaged in the hateful traffic was Captain John Hawkins. The English slave traders were at first altogether occupied in supplying the Spanish settlements. Indeed, the reign of Elizabeth passed without any English colony having been permanently established in America. But in 1620 a Dutch ship from the coast of Guinea visited Jamestown in Virginia, and sold a part of her cargo of negroes to the tobacco-planters. This was the first beginning of slavery in British America; the number of negroes was afterward continually increased—though apparently at first slowly—by importation, and the field-labor was more and more performed by servile hands, so that in 1790 the State of Virginia, which is only a small part of the original colony so named, contained 200,000 negroes. It may be truly said that from the latter part of the seventeenth century, when the nature of the slave trade began to be understood by the public, all that was best in England was adverse to it.

The question of the legal existence of slavery in Great Britain and Ireland was raised in consequence of an opinion given in 1729 by York and Talbot, attorney-general and solicitor-general at the time, to the effect that a slave by coming into those countries from the West Indies did not become free, and might be compelled by his master to return to the plantations. Chief-Justice Holt had expressed a contrary opinion; and the matter was brought to a final issue by Mr. Granville Sharp in the case of the negro Somerset. It was decided by Lord Mansfield, in the name of the whole bench, on June 22, 1772, that as soon as a slave set his foot on the soil of the British islands he became free. In 1776 it was moved in the House of Commons by David Hartly, son of the author of *Observations on Man*, that "the slave trade was contrary to the laws of God and the rights of men;" but this motion—the first which was made on the subject—failed; public opinion on the question was far from being yet fully ripe.

In consequence of the numerous petitions presented to parliament a committee of privy council was appointed by the crown in 1788 to inquire concerning the slave trade; and Mr. Pitt moved that the House of Commons should early in the next session take the subject into consideration. Wilberforce's first motion for a committee of the whole House upon the question was made on March 19, 1789, and this committee proceeded to business on May 12th the same year. After an admirable speech, Wilberforce laid on the table twelve resolutions which were intended as the basis of a future motion for the abolition of the trade. The discussion of these was postponed to the next session, and in 1790–91 evidence was taken upon them. At length, on April 18th of the latter year, a motion was made for the introduction of a bill to prevent the further importation of slaves into the British colonies in the West Indies. On April 2, 1792, Wilberforce again moved that the trade ought to be abolished; an amendment in favor of gradual abolition was carried, and it was finally resolved that the trade should cease on January 1, 1796. When a similar motion was brought forward in the Lords the consideration of it was postponed to the following year, in order to give time for the examination of witnesses by a committee of the House. A bill in the Commons in the following year to abolish that part of the trade by which British merchants supplied foreign settlements with slaves was lost on the third reading; it was renewed in the Commons in 1794 and carried there, but defeated in the Lords. Then followed several years during which efforts were made by the abolitionists in parliament with little success. But in 1806, Lord Grenville and Fox having come into power, a bill was passed in both Houses to put an end to the British slave trade for foreign supply, and to forbid the importation of slaves into the colonies won by the British arms in the course of the war. On June 10 of the same year Fox brought forward a resolution "that effectual measures should be taken for the abolition of the African slave trade in such a manner and at such a period as should be deemed advisable," which was carried by a large majority. A similar resolution was successful in the House of Lords. A bill was then passed through both houses forbidding the employment of any new vessel in the trade. Finally, in 1807 a bill was presented by Lord Grenville in the House of Lords providing for the abolition of the trade, was passed by a large majority, was then sent to the Commons (where it was moved by Lord Howick), was there amended and passed, and received the royal assent on March 25th. The bill enacted that no vessel should clear out for slaves from any port within the British dominions after May 1, 1807, and that no slave should be landed in the colonies after March 1, 1808.

The Act of 1807 was habitually violated, as the traders knew that, if one voyage in three was successful, they were abundantly remunerated for their losses. This state of things, it was plain, must continue as long as the trade was only a contraband commerce, involving merely pecuniary penalties. Accordingly, in 1811, Brougham carried through parliament a bill declaring the traffic to be a felony punishable with transportation. Some years later another act was passed, making it a capital offense; but this was afterward repealed. The law of 1811 proved effectual, and brought the slave trade to an end so far as the British dominions were concerned. Mauritius, indeed, continued it for a time. That island, which had been ceded by France in 1810, three years after the abolition, had special facilities for escaping observation in consequence of the proximity of the African coast; but it was soon obliged to conform.

The abolition of the French slave trade was preceded by stormy struggles and by many deplorable excesses. The western part of St. Domingo, nominally belonging to Spain, had been occupied by buccaneers, who were recognized and supported by the French government, and had been ceded to France at the peace of Ryswick in 1697. So vast was the annual importation of enslaved negroes into this colony before 1791 that the ratio of the blacks to the whites was as 16 to 1. On August 23d a rebellion of the negroes broke out in the northern province of St. Domingo, and soon extended to the western province, where the mulattoes and blacks combined. Many enormities were committed by the insurgents, and were avenged with scarcely inferior barbarity. The planters now offered their allegiance to Great Britain; and an English force landed in the colony. But it was insufficient to encounter the hostility of the republican troops and the revolted negroes and mulattoes; it suffered dreadfully from disease, and was obliged to evacuate the island in 1798. On the departure of the British the government remained in the hands of Toussaint l'Ouverture, the noblest type ever produced by the African race. Of the violent and treacherous conduct of Bonaparte toward the island and its eminent chief we cannot here give an account; the final issue was that the blacks drove from their soil the forces sent to subdue them, and founded a constitution of their own, which was more than once modified.

England had not been the first European power to abolish the slave trade; that honor belongs to Denmark; a royal order was issued May 16, 1792, that the traffic should cease in the Danish possessions from the end of 1802. The United States had in 1794 forbidden any participation by American subjects in the slave trade to foreign countries; they now prohibited the importation of slaves from Africa into their own dominion. This act was passed March 2, 1807; it did not, however, come into force till January 1, 1808. At the Congress of Vienna (opened November 1, 1814), the principle was acknowledged that the slave trade should be abolished as soon as possible, but the determination of the limit of time was reserved for separate negotiation between the powers. When the English slave trade had been closed, it was found that the evils of the traffic, as still continued by several other nations, were greatly aggravated. In consequence of the activity of the British cruisers the traders made great efforts to carry as many slaves as possible in every voyage, and practiced atrocities to get rid of the slaves when capture was imminent. It was, besides, the interest of the cruisers, who shared the price of the captured slave-ship, rather to allow the slaves to be taken on board than to prevent their being shipped at all. Thrice as great a number of negroes as before, it was said, was exported from Africa, and two-thirds of these were murdered on the high seas. It was found also that the abolition of the British slave trade did not lead to an improved treatment of the negroes in the West Indies. The slaves were overworked now that fresh supplies were stopped, and their numbers rapidly decreased. In 1807 there were in the West Indies 800,000; in 1830 they were reduced to 700,000. It became more and evident that the root of the evil could be reached only by abolishing slavery altogether. England abolished slavery in her West Indian dominions in 1838. The owners were paid $100,000,000 indemnity.

The example of Great Britain was gradually followed by the other European states, and some American ones had already taken action of the same kind. The immediate emancipation of the slaves in the French colonies was decreed by the Provisional Government of 1848. In 1858 it was enacted that every slave belonging to a Portuguese subject should be free in twenty years from that date. The Dutch emancipated their slaves in 1863. Several of the Spanish American states, on declaring their independence, had adopted measures for the discontinuance of slavery within their limits. It was abolished by a decree of the Mexican republic on September 15, 1829. The Government of Buenos Ayres enacted that all children born to slaves after January 31, 1813, should be free; and in Colombia it was provided that those born after July 16, 1821, should be liberated on attaining their eighteenth year.

Three of the most important slave systems still remained in which no steps toward emancipation had been taken—those of the Southern United States, of Cuba, and of Brazil.

Slavery was far from being approved in principle by the most eminent of the fathers of the American Union. Washington in his will provided for the emancipation of his own slaves; he said to Jefferson that it was "among his first wishes to see some plan adopted by which slavery in his country might be abolished by law," and again he wrote that to this subject his own suffrage should never be wanting. At the convention of Philadelphia in 1787, where the constitution was settled, the sentiments of the framers were against slavery; but South Carolina and Georgia insisted on its recognition as a condition of their joining the Union, and even an engagement for the mutual rendition of fugitive slaves was embodied in the federal pact. The *words* "slave" and "slavery" were, however, excluded from the constitution, "because," as Madison says, "they did not choose to admit the right of property in man" in direct terms; and it was at the same time provided that Congress might interdict the foreign slave after the expiration of twenty years. It must not be forgotten that either before or soon after the formation of the Union the Northern States—beginning with Vermont in 1777, and ending with New Jersey in 1804—either abolished slavery or adopted measures to effect its gradual abolition within their boundaries. But the principal operation of (at least) the latter change was simply to transfer Northern slaves to Southern markets.

We cannot follow in detail the several steps by which the slave power for a long time persistently increased its influence in the Union. The pioneer of the more recent abolitionist movement was Benjamin Lundy (1789-1839). He was followed by William Lloyd Garrison (1805-1879), Elijah P. Lovejoy (1802-1837)—a martyr, if ever there was one—Wendell Phillips, Charles Sumner, John Brown (b. 1800, hanged 1859), all of whom were in their several ways leading apostles or promoters of the cause. It gradually became apparent that the question could not be settled without an armed conflict. The designation of Abraham Lincoln as president in November, 1860, was the signal for the rising of the South. The North at first took arms simply to maintain the Union; but the far-sighted politicians from the first, and soon the whole nation, saw that the real issue was the continued existence or the total abolition of slavery. See UNITED STATES.

The war was closed by the surrender at Appomattox (April 9, 1865), but already in 1862 slavery in the Territories had been abolished by Congress; on the 22d of September of the same year Lincoln had issued his proclamation of freedom to the slaves; and in 1864 a constitutional amendment had been passed abolishing and forever prohibiting slavery throughout the United States.

An act was passed by the Spanish legislature in 1870, providing that every Cuban slave who had then passed, or should thereafter pass, the age of sixty should be at once free, and that all yet unborn children of slaves should also be free. The latter, however, were to be maintained at the expense of the proprietors up to their eighteenth year, and during that time to be kept as apprentices to such work as was suitable for their age. This is known as the Moret Law. Mr. Crowe, English consul-general in the island, has lately (1885) stated that "the institution is rapidly dying—that in a year, or at most two, slavery, even in its present mild form, will be extinct."

There was a convention between Great Britain and Brazil in 1826 for the abolition of the slave trade, but it was habitually violated in spite of the English cruisers. In 1830 the traffic was declared piracy by the emperor of Brazil. England asserted by the Aberdeen Act (1845) the right of seizing suspected craft in Brazilian waters. Yet by the connivance of the local administrative authorities 54,000 Africans continued to be annually imported. In 1850 the trade is said to have been decisively put down. The planters and mine proprietors cried out against this as a national calamity. The closing of the traffic made the labor of the slaves more severe, and led to the employment on the plantations of many who before had been engaged in domestic work; but the slavery of Brazil has always been lighter than that of the United States. On September 28, 1871, the Brazilian chambers decreed that slavery should be abolished throughout the empire. Though existing slaves were to remain slaves still, with the exception of those possessed by the government, who were liberated by the act, facilities for emancipation were given; and it was provided that all children born of female slaves after the day on which the law passed should be free. They were, however, bound to serve the owners of their mothers for a term of twenty-one years.

In Russia, a country which had not the same historical antecedents with the Western nations, properly so called, and which is in fact more correctly classed as Eastern, while slavery had disappeared, serfdom was in force down to our own days. The rural population of that country, at the earliest period accessible to our inquiries, consisted of (1) slaves, (2) free agricultural laborers, and (3) peasants proper, who were small farmers or cottiers and members of a commune. The sources of slavery were there, as elsewhere, capture in war, voluntary sale by poor freemen of themselves, sale of insolvent debtors, and the action of the law in certain criminal cases. The first symptoms of a reaction appear in the reign of Paul (1796-1801). He issued an ukase that the serfs should not be forced to work for their masters more than three days in each week. There were several feeble attempts at further reform, and even abortive projects of emancipation, from the commencement of the present century. But no decisive measures were taken before the accession of Alexander II. (1855). That emperor, after the Crimean War, created a secret committee composed of the great officers of state, called the chief committee for peasant affairs, to study the subject of serf-emancipation. Of this body the grand-duke Constantine was an energetic member. To accelerate the proceedings of the committee advantage was taken of the following incident. In the Lithuanian provinces the relations of the masters and serfs were regulated in the time of Nicholas by what were called inventories. The nobles, dissatisfied with these, now sought to have them revised. The government interpreted the application as implying a wish for the abolition of serfdom, and issued a rescript authorizing the formation of committees to prepare definite proposals for a gradual emancipation. A circular was soon after sent to the governors and marshals of the nobility all over Russia proper, informing them of this desire of the Lithuanian nobles, and setting out the fundamental principles which should be observed "if the nobles of the provinces should express a similar desire." Public opinion strongly favored the projected reform; and even the masters who were opposed to it saw that, if the operation became necessary, it would be more safely for their interests intrusted to the nobles than to the bureaucracy. Accordingly during the year 1858 a committee was created in nearly every province in which serfdom existed. From the schemes prepared by these committees, a general plan had to be elaborated, and the government appointed a special imperial commission for this purpose. The plan was formed, and, in spite of some opposition from the nobles, which was suppressed, it became law, and serfdom was abolished (February 19 = March 3, 1861).

The slavery of the Mohammedan East is usually not the slavery of the field but of the household. The slave is a member of the family, and is treated with tenderness and affection. The Koran breathes a considerate and kindly spirit toward the class, and encourages manumission. The child of a slave girl by her master is born free, and the mother is usually raised to be a free wife. But behind this slavery, however mild in itself, stands the slave trade, with its systematic man-hunting, which has been, and still is, the curse of Africa. The traffic in slaves has been repeatedly declared by the Ottoman Porte to be illegal throughout its dominions, and there have been several conventions between Great Britain and the khedive for its suppression in Egypt; but it is still largely carried on both in the latter country and in Turkey, owing to the laxity and too often the complicity of the government officials.

SLAVS. According to the tables published by Boudilovich in connection with the admirable ethnological map of Mirkovich (St. Petersburg, 1875), the Slavs may be grouped geographically as follows:—

I. SOUTHEAST DIVISION.—1. *Russians.*—(*a*) The Great Russians (*Velikorousskie*), who occupy the governments round Moscow and extend as far north as Novgorod and Vologda, south to Kieff and Voronezh, east to Penza, Simbirsk, and Vyatka, and west to the Baltic provinces and Poland; they number about 40,000,000. The Little Russians (*Malorossiane*), who include the Rousines or Rousniaks in Galicia and the Boiki and Gouzouli in Bukovina; they number 16,370,000. Drawing a straight line from Sandec near Cracow to the Asiatic frontier of Russia, we shall find their language the dominant tongue of Galicia and all the southern parts of Russia till we come to the Caucasus. It is also spoken in a strip of territory in the north of Hungary. (*c*) The White Russians, inhabiting the western governments; they number 4,000,000.

2. *Bulgarians*, including those in Russia, Austria, Roumania, Bulgaria, eastern Roumelia, and those under Turkish Government in Macedonia; their total number is 5,123,592.

3. *Servo-Croats*, including those of Servia, Montenegro, the southern part of Hungary, and a few in the south of Russia; they are returned as numbering 5,940,539. Here also may be placed the Slovenes, including those in Styria, Carinthia, and Carniola, amounting to 1,287,000.

II. WESTERN DIVISION.—1. *Poles*, divided between Russia, Austria, and Prussia; they number 9,492,162; under this head may be included the Kashoubes near Dantzic, numbering 111,416.

2. *Chekhs* and *Moravians*, 4,815,154 in number; here also may be included the Slovaks, numbering 2,223,820.

3. *Lusatian Wends* or *Sorbs*, Upper and Lower, partly in Saxony and partly in Prussia The *Upper Wends* number 96,000, the *Lower* 40,000.

Total number of Slavs in both divisions 89,499,683.

Originally the Slavs were spread over a great part of northern Germany, extending as far as Utrecht, which was anciently called Wiltaburg and was a city of the Wilzen. Thus Slavonic was certainly spoken in Pomerania, Mecklenburg, Brandenburg, Saxony, west Bohemia, Lower Austria, the greater part of Upper Austria, north Styria and north Carinthia, a large part of what is now Hungary, and in the localities now occupied by Kiel, Lübeck, Magdeburg, Halle, Leipsic (=Lipsk, the city of lime-trees), Baireuth, Linz, Salzburg, Gratz (=Gradetz, Gorodetz), and Vienna. The names of the old Slavonic tribes originally settled in these parts of Germany are given in Schafarik's *Slawische Alterthümer*, to which work the reader desiring further information must be referred. They are mentioned frequently in such writers as Helmold, Dietmar, Arnold, Wittekind, and others. We hear of a commercial city of importance, which some writers have rather fantastically termed the Slavonic Amsterdam, called Wolin, on the island of the same name, which was known as Winetha to the Germans and as Julin to the Danes. Schafarik even wished to see the Slavonic tribe of the Wilzen in English Wiltshire. This, however, cannot be accepted; the original name is Wilsætas and that of the town Wiltun, the town on the river Wily. It has long been a generally received opinion that the modern Greeks have a large Slavonic admixture. This opinion was boldly asserted some years ago by Fallmerayer and has not been upset even by the labors of M. Sathas. He dwells much upon the form *Σθλαβηνοι* as distinct from *Σκλαβηνοι;* but his corruption seems to be owing to some such false analogy as *ἐσθλός*. Mikloisch, in his *Etymologisches Wörterbuch der slavischen Sprachen* (1886), considers the two forms to be identical. In like fashion Procopius connects Serbi with *Σπόροι* and Constantine Porphyrogenitus turns Svatopluk into *Σφενδόπλοκος*. Mediæval Greece, especially the Peloponnesus, abounded with Slavonic names, which are now being replaced by others drawn from classical sources. Kollar and Wolanski wished to find a Slavonic population in Italy; but their opinions are considered the wild dreams of unscientific patriots, though these views found their way into such works as the *Varronianus* of Doctor Donaldson. Equally unfounded appears to be the belief that a Slavonic element may be traced in Spain and Asia Minor. If the Slavs have lost in the west of Europe, they have gained in the east considerably, as Russia has encroached upon the Ugro-Finnish tribes of the northern and eastern portions of its empire, and many of these races are now in various stages of Russification.

As to the original home of the Slavonic race there are three leading opinions:—(1) the Slavs settled in Europe at a period contemporaneous with or shortly after the arrival of the Teutonic and other Indo-European families; (2) they first made their appearance in Europe with the Huns, Avars, and other Asiatic barbarians in the third century after Christ; (3) they originated in Europe, as did the so-called Indo-European race altogether. This last view has been maintained by Penka and Schrader.

The first of these views has been supported by Schafarik. He considers that the Slavs left Asia in very early times for the following reasons:—(*a*) the fact that the Slavonic languages are more closely connected with European tongues than with those of Asia, even granting the many affinities of Slavonic with Zend or (as has been recently shown by Hübschmann) with Armenian; (*b*) the similarity of the manners and customs of the Slavs to those of the Celts, Germans, and other European populations; (*c*) the occurrence of many mountains, rivers, and towns having Slavonic names which are mentioned long before the Slavs themselves are found in history; (*d*) the fact that the Slavs are always spoken of by the earlier writers in terms which show that these writers considered them to be an ancient European nation, and were struck with the large area over which their populations extended. Moreover, the arrival at a comparatively late period of such large hordes would have made a great impression upon the surrounding nations at the time, and this would certainly have found an echo in their historians and chroniclers.

The second of the opinions alluded to above has been adopted by Wocel, according to whom the Slavs in the north of Germany on the Elbe, Moldau, Sale, Spree, as also those living south of the Danube, were not living in juxtaposition in the Bronze Age, but wandered into those regions some centuries after the birth of Christ. In proof of this assertion he cites many names of objects which are common to the Slavonic languages and yet could not have been known to any people in the Bronze Period.

Pictet placed the original home of the German and Litu-Slavic races on the northern bank of the Oxus. Thence he thought they came over the extensive plains of Scythia to the Pontus Euxinus.

The doctrine of the European origin of the Aryans appears to be steadily gaining ground.

Leaving now the attempts to determine the primitive home of the Slavs and the date of their immigration into Europe, and also the names which they have in common, whether used by themselves or given by foreigners, we will trace, as far as possible, the derivation of the chief appellations of the Slavonic peoples. (1) *Russians*—For an analysis of this name see Russia. (2) *Bulgarians*—By the third century we find Slavs settled between the Danube and the Balkans. Immigrations were going on till the middle of the seventh century, as these hordes were driven southward by new invaders. About 681 the Slavonic settlers fell under the yoke of the Bulgarians, a Ugro-Finnish race, if we accept the views of Schafarik, Drinoff, and others. The origin of the Bulgarians themselves is obscure. Some have made them Tartars. Professor Ilovaiski believes them to have been Slavs. The theory which connects the name "Bulgarian," "Bolgare," with the Volga is now no longer held. Early modifications of the name, such as Burgari, Wurgari, etc., show its analogy with forms like Onoguri, Uturguri, Kutriguri. The elements of the word are *bul* and *gari*. Professor Vambéry attempts to derive the name from the Turkish verb *bulgamak*, "to revolt;" but this seems little better than a guess. We are told that Koubrat, a Bulgarian prince, made himself independent of the Avars, and that on his death his territories were divided among his five sons. The eldest remained in the ancient settlement on the Volga, where the ruins of the former capital, Bolgari, are still to be seen. The third son, Asparoukh, crossed the Dnieper and the Dniester, and settled in a place called Onklus, probably the old Slavonic *ongl*, "angulus," between the Transylvanian Alps and the Danube. From this place they migrated to the localities which they have since occupied, where they became mixed with the original settlers, to whom they gave their name, just as the German Franks imposed theirs on the Gauls, and a branch of the Slavonians, took the Finnish name of their conquerors. (3) *Serbs.*—See Servia. The name "Croat" has been already explained under Servia (*l.c.*) (4) The *Slovenes* have preserved an old form of the family name, and therefore no explanation is necessary. (5) *Poles.*—The first authentic date of their history is the year 963. Perhaps they are the Bulanes of Ptolemy. See Poland. (6) *Bohemians* or *Chekhs.*—The word "Bohemia"—"home of the Boii," a Celtic tribe—has nothing to do with the Slavs who came into the country about 495, after the Marcomanni, who had dispossessed the Boii. The derivation of the name "Chekh" or Czech has never been satisfactorily traced. Dobrovsky sought to connect it with a word *četi*, signifying "to begin," and thus makes the name imply the original inhabitants. Schafarik, however, does not indorse this etymology. Perwolf connects it with a root *cak*, "to beat," and thus makes the name mean "the warriors." Whatever the word "Chekh" may signify, it occurs, as Schafarik has shown, in other Slavonic countries. (7) *Lusatian Wends* or *Sorbs.*—The word "Lusatia" (German *Lausitz*) is derived from the Slavonic *lug* or *luza*, signifying a low, marshy country.

The first to attempt a classification of the Slavonic languages was Dobrovsky, who was followed by Schafarik and Schleicher. These agree in the main, except that Schafarik was so little acquainted with Bulgarian—at that time almost a lost language—that he grouped it with Servian.

Various opinions have been held as to what languages are to be considered the closest congeners of the Slavonic branch. That they stand in intimate relations to Lithuanian and Lettish has long been agreed; and as a convenient classification it is customary to speak of them together as the Litu-Slavic family.

We now proceed to classify the Slavonic languages according to their dialects. The following table has been adapted (in the main) from the valuable Russian *History of Slavonic Literatures* by Pipin and Spasovich:

South-Eastern Branch.—*Russian.*—(1) Great Russian: Moscow, Novgorod and northern, Siberian, and central Russian. (2) Little Russian: eastern, western (sometimes called Red Russian), and Carpathian. (3) White Russian. *Bulgarian.*—(1) Old Bulgarian (the ecclesiastical language. (2) Modern Bulgarian: Upper Mœsian, Lower Mœsian, and Macedonian. *Servo-Croatian* and *Slovenish.*—(1) Servo Croatian: southern or Herzegovinian, Syrmian, Resanian, and language of the coast or Dalmatian. (2) Slovenish: dialects of Upper, Middle, and Lower Carniola, Styrian, Ugro-Slovenish, Resanian, and Croato-Slovenish.

Western Branch.—(1) Polish: Masovian or Mazurian, Great Polish, Silesian, and Kashoubish. (2) Bohemian: Chekish, Moravian, and Slovakish. (3) Lusatian Wendish or Sorbish: Upper Lusatian and Lower Lusatian. (4) Polabish (extinct).

SLAVYANSK, a town of Russia, in the government of Kharkoff, situated 158 miles by rail to the southeast of the town of Kharkoff, on the Torets river and close by several salt lakes. From these salt is extracted to the annual value of more than $50,000; there are also several tallow-works in the place. The Slavyansk merchants carry on a brisk trade in salt, cattle, and tallow. The population (11,650 in 1870) reached 15,400 in 1883.

SLEEP is a normal condition of the body, occurring periodically, in which there is a greater or less degree of unconsciousness due to inactivity of the nervous system, and more especially of the brain and spinal cord. It may be regarded as the condition of rest of the nervous system during which there is a renewal of the energy that has been expended in the hours of wakefulness; for in the nervous system the general law holds good that periods of physiological rest must alternate with periods of physiological activity, and, as the nervous system is the dominating mechanism in the body, when it reposes, all the other systems enjoy the same condition to a greater or less extent. Rest alternates with work in all vital phenomena.

The coincidence of the time of sleep with the occurrence of the great terrestrial phenomena that cause night is more apparent than real. The oscillations of vital activity are not correlated to the terrestrial revolutions as effect and cause, but the occurrence of sleep, in the majority of cases, on the advent of night is largely the result of habit. While the darkness and stillness of night are favorable to sleep, the state of physiological repose is determined more by the condition of the body itself. Fatigue will normally cause sleep at any time of the twenty-four hours. Thus many of the lower animals habitually sleep during the day and prowl in search of food in the night; some hibernate during the winter season, passing into long periods of sleep during both day and night; and men whose avocations require them to work during the night find that they can maintain health and activity by sleeping the requisite time during the day.

The intensity of sleep has been measured by Kohlschütter by the intensity of the sound necessary to awaken the sleeper. This intensity increases rapidly during the first hour, then decreases, sometimes rapidly, sometimes slowly, during the next two or three hours, and then very slowly until the time of waking. This statement agrees generally with experience. As a rule the deeper the sleep the longer it lasts.

Various physiological changes have been observed during sleep, but much remains to be done in this direction. The pulse becomes less frequent; the respiratory movements are fewer in number and are almost wholly thoracic, not abdominal; all the secretions are reduced in quantity; the gastric and intestinal peristaltic movements are less rapid; the pupils of the eye are contracted and during profound sleep are not affected by light; and the eyeballs are rotated upward. The pupils dilate slightly when strong sensory or auditory stimuli are applied, and they dilate the more the lighter the sleep; at the moment of waking they become widely dilated. While muscular relaxation is general, there seems to be increased contraction of certain sphincter muscles, as the circular fibers of the iris and the fibers concerned in closing the eyelids. The state of the circulation of the brain has been frequently investigated. The older view was that there was a degree of plethora or congestion of the vessels of the brain, as in the state of matters in coma, to which the state of sleep has a superficial resemblance. Coma, however, is not sleep, but a condition of inactivity of the cerebral matter owing to the accumulation of dark venous blood in its vessels. This has been actually observed in cases where it was possible to see the brain. During sleep the surface of the exposed brain has been observed to become pale and to shrink somewhat from the sides of the opening (Blumenbach).

While it is easy to state that sleep is caused by fatigue of the nervous system, it is a more difficult matter to explain what the precise changes are that produce the state of unconsciousness. Various hypotheses have been advanced, but it cannot be said that any one is wholly satisfactory. Aware that the fatigue of muscle is associated with the accumulation of sarcolactic acid, Preyer surmised that the activity of nervous matter might be interfered with by the accumulation in the nerve-centers of some such acid, or of its soda salt (lactate of soda), but this view has not been supported by the results of experiment, as the injection into the blood of a dose of lactate of soda has not produced sleep. Pflüger has observed that frogs deprived for a considerable time of oxygen passed gradually into a state resembling profound sleep, and he has advanced the theory that there is no organ of the body so quickly affected by deprivation of oxygen as the brain. According to Pflüger, the phenomena of life depend on a dissociation of living matter, and in particular the activity of the cerebral substance connected with psychical states depends on dissociation changes in the gray matter. To excite the dissociation, however, oxygen is necessary. The oxygen unites with certain of the compounds set free by the dissociation, forming, among other substances, carbonic acid. If such matters as these that unite with oxygen are in sufficient amount to use up all the oxygen, the gray matter of the brain suffers from a deficiency of oxygen (or from its absence), and also from the accumulation of carbonic acid. According to such a theory, cerebral activity depends on cerebral respiration, and sleep is a kind of cerebral asphyxia. Some such condition is not improbable, but it must be stated that the evidence at present in support of it is meager.

There is little doubt that all living beings require periods of repose alternating with periods of activity. Many plants close their flowers and bend their petioles at certain times of the day. These phenomena, called "the sleep of plants," depend apparently on changes in solar radiation, and there is no reason to believe that during the time of quiescence any reparative processes go on, as during the sleeping period of animals.

The amount of sleep required by man varies according to age, sex, and habit. The popular notion that a child sleeps half its time, an adult one-third, while an old person may do little except eat and sleep is not far wrong. In early life the cerebral faculties appear to be easily exhausted and during the frequent and prolonged sleeps of infancy the brain rests and the vegetative changes connected with nutrition and growth go on actively. As life advances, less sleep is required, until in adult life a period of seven or eight hours is sufficient. As a rule, women require more sleep than men; but much depends on habit. Thus most women bear the loss of sleep in the first instance better than men, because they have been accustomed more to loss or irregularity of sleep. The effect of habit is well seen in nurses, both male and female, who will often be able to work for weeks continuously with snatches of sleep, not amounting to more than two or three hours daily. Sooner or later, however, even in these cases, nature asserts her demands, and prolonged sleep is necessary to maintain health and vigor.

Wakefulness during the time when one ought to be asleep is frequently a distressing condition, undermining the strength and incapacitating for active and efficient work. Insomnia or sleeplessness often afflicts those of active mental habits and lays the foundation of premature decay. From what has been stated as to the cause of sleep it is evident that whatever tends to augment unduly the circulation through the brain may cause wakefulness. Thus long-continued or excessive intellectual action, or any powerful emotion, may be injurious. Moderate intellectual work is favorable to sleep. The remedy in such cases is to avoid as far as possible the exciting causes or to counteract them by bodily exercise and attention to the general health. When sleeplessness overtakes a brain-worker it is a sure indication that less intellectual work must be done, and that he ought to betake himself, if possible, to out-of-door exercise in the pure air of the country. It is dangerous to persist, and still more to induce sleep artificially by drugs, as the overworked organ may become the seat of permanent disease or pernicious habits may be formed. The posture of the body in bed may influence sleep. Thus such positions as impede the flow of blood from the brain without affecting the supply of blood to it by the arteries may cause sleeplessness. Sometimes in cases of insomnia from excessive mental mork there is the distressing condition that sleep disappears when the person lies down in bed, although before lying down he felt drowsy. In such a case resting with the head high may produce the desired result. Insomnia may also be caused by various functional diseases, whereby the amount of blood in the brain is increased. Thus in young females derangement of the menstrual functions may cause a hyperæsthesia or increased sensibility to such an extent that the sufferer cannot sleep, or if sleep be obtained, it is so light as to be dispelled by weak sensory impressions that would fail to arouse a healthy person. Again, an irregular or deficient action of the heart may cause wakefulness, especially if associated with coldness of the extremities. In such cases the application of heat to the feet and attention to the digestive organs may produce refreshing sleep. Lastly, the excessive use of various drugs, such as alcohol, opium, belladonna, Indian hemp, tea, and coffee, may cause sleeplessness. In these cases a moderate dose usually acts as a hypnotic, while frequently repeated doses have the reverse effect. Thus sleeplessness is one of the most distressing symptoms of delirium tremens, and it occurs also in those in the habit of indulging in opium, morphia, chloral, or Indian hemp. The general correctives of sleeplessness are active work, a moderate amount of bodily exercise, freedom from worry and anxiety, the use of the warm bath in some cases to allay irritability before going to bed, and such a posture in bed as the individual has found in his own case to be favorable.

Somnambulism.—Some persons rise during sleep, walk about, apparently unconscious of all external impressions, after a time return to bed, and when they are awake they have no recollection of any of these occurrences. Sometimes the actions performed are of a complicated character and bear some relation to the daily life of the sleeper. Thus a cook has been known to rise out of bed, carry a pitcher to a well in the garden, fill it, go back to the house, fill various vessels carefully and without spilling a drop of water, then return to bed, and have no recollection of what had transpired. Again, somnambulists have been observed to write letters or reports, execute drawings, and play upon musical instruments. Frequently they have gone along dangerous paths, executing delicate movements with precision. Four types of somnambulist may be noticed—(1) those who speak without acting, a common variety often observed in children and not usually considered somnambulistic; (2) those who act without speaking, also well known and the most common type; (3) these who both act and speak, more exceptional; and (4) those who both act and speak and who have not merely the sense of touch active, but also the senses of sight and hearing. The fourth class is the most extreme type and merges into the physiological condition of mesmerism or hypnotism. Many observations indicate that, at all events in some cases, the somnambulist engaged, for example, in writing, has a mental picture of the page before him and of the words he has written. He does not see what he really writes. This has been proved by causing a person to write on a sheet of paper lying on the top of other sheets. After he had been allowed to write a few sentences, the sheet was carefully withdrawn and he continued his writing on the next sheet, beginning on the new sheet at the corresponding point where he left off on the first one. Moreover, the somnambulist, by force of habit, stroked t's and dotted i's at the exact places where the t's and i's would have been had he written continuously on one sheet, showing that what he was conscious of was not what was before him but the mental picture of what he had done.

SLEIDANUS, John, the annalist of the Reformation, was born at Schleiden (now a small village in the Oleffthal, about forty-two miles southwest of Cologne) in 1506 or 1508. He finished his great work for the press in 1554; but want of money, the death of his wife, and other misfortunes compelled him to delay printing. The book at length appeared—*Commentariorum de statu religionis et reipublicæ, Carolo V. Cæsare, Libri XXVI.* (translated into English by John Daws in 1560 and by G. Bohum in 1689). But the troubles of Sleidanus were not ended. The work was too impartial to please any one, and even the gentle Melanchthon was unable to praise it. It remains, notwithstanding, the most valuable contemporary history of the times of the Reformation, and contains the largest collection of important documents. The author died at Strasburg in October, 1556, in poverty, and inconsolable since the death of his wife.

SLIGO, a maritime county in the northwest of Ireland, in the province of Connaught, is situated between 53° 54′ and 54° 28′ N. latitude and between 8° 10′ and 9° 10′ W. longitude, and is bounded north by the Atlantic, east by Leitrim, southeast by Roscommon, and south and west by Mayo. The total area is 451,129 acres, or nearly 705 square miles.

Agriculture.—There is considerable variety both in the character of the soil and in the agricultural advancement in different parts of the county. In some parts it is a light sandy loam resting on a freestone bottom, and in the lower districts a rich and deep mold prevails resting on a substratum of limestone. Owing to the moistness of the climate cattle feeding is found to be the most remunerative method of farming.

Manufactures and other Industries.—Coarse woolens and linens are manufactured for home consumption, and there are tanneries, distilleries, and breweries in the principal towns. A considerable general trade is carried on at the ports of Ballina (on the Moy) and Sligo. The fisheries on the coast are valuable, and there are important salmon fisheries at the mouths of the rivers.

Administration and Population.—The county is divided into 6 baronies, and contains 37 parishes and 4 parts of parishes, and 1,292 townlands. For parliamentary representation the county has since 1885 formed two divisions (North and South), each returning a member. Between 1841 and 1851 the population decreased from 180,886 to 128,515 or 29 per cent., and by 1881 it had decreased to 111,578 (55,144 males, 56,434 females), or 38.3 per cent. since 1841.

Sligo, the chief town of the above county and an important seaport, is finely situated at the mouth of the Garvogue, near Lough Gill, 137 miles northwest of Dublin by rail. There is an important butter-market, and maize, flour, and corn mills. The population in 1861 was 10,693, and in 1881 it was 10,808.

SLIVEN, **Slivno**, **Selimnia**, **Islemniye**, or **Islimye**, an important town of East Roumelia, situated at the southern base of the Balkans, 750 feet above the sea, where several mountain streams flow south to the Tunja, a tributary of the Maritza. The population (Turks, Bulgarians, Armenians, Greeks, Jews, and Gipsies) was 22,000 in 1872.

SLOANE, Sir Hans, a celebrated collector and successful physician, was born on April 16, 1660, at Killileagh in county Down, Ireland. He had as a youth a strong turn for collecting objects of natural history and other curiosities. This led him to the study of medicine, which he went to London to pursue, directing his attention assiduously to botany, materia medica, and pharmacy. His collecting propensities made him useful to the more philosophically minded Ray and Boyle, and procured him their patronage. After four years in London he traveled through France, spending some time at Paris and Montpellier, and taking his M.D. degree at the university of Orange. He returned to London with a considerable collection of plants and other curiosities, of which the former were sent to Ray and utilized by him for his *History of Plants.* Sloane was quickly elected into the Royal Society, and at the same time he had the good fortune to attract the notice of Sydenham, who took a fancy to him and gave him valuable introductions to practice.

On the accession of George I. Sloane was made physician-general to the army, and in 1716 was created a baronet, being the first medical practitioner to receive an hereditary title. In 1719 he became president of the College of Physicians, and held the office sixteen years. In 1727 he succeeded Sir Isaac Newton in the presidential chair of the Royal Society; he retired from it at the age of eighty, "much against the inclination of that respectable body, who chose Martin Folkes to succeed him, and in a public assembly thanked him for the great and eminent services which he had rendered them." Sloane's memory survives more by his judicious investments than by anything that he contributed to the subject-matter of natural science or even of his own profession. On his death on January 11, 1753, he bequeathed his books, manuscripts, prints, drawings, pictures, medals, coins, seals, cameos, and other curiosities to the nation, on condition that parliament should pay to his executors $100,000, which was a good deal less than the value of the collection. The bequest was accepted on those terms, and the collection, together with George II.'s royal library, etc., was open to the public at Bloomsbury as the British Museum in 1759.

SLODTZ, René Michel or Michel Ange, French sculptor, was born at Paris September 29, 1715. He died at Paris October 26, 1764.

SLONIM, a district town of Russia, in the government of Grodno, 105 miles southeast of Grodno and 20 from the railway from Moscow to Warsaw, on the high craggy banks of the Schara. The population was 21,110 in 1883.

SLOTH. The sloths, as the animals of the Bradipodidæ family are called on account of the habitual sluggishness of their movements, are the most strictly arboreal of all mammals, living entirely among the branches of trees, usually hanging under them, with their backs downward, and clinging to them with the simple hook-like organs to which the terminations of all their limbs are reduced. When they are obliged from any cause to descend to the ground, which they rarely, if ever, do voluntarily, their limbs, owing to their unequal length and the peculiar conformation of the feet—which allows the animals to rest only on the outer edge—are most inefficient for terrestrial progression, and the sloths crawl along a level surface with considerable difficulty. Though generally slow and inactive, even when in their natural haunts, they can on occasions travel with considerable rapidity along the branches, and, as they do not leap, like most other arboreal creatures, they avail themselves of the swaying of the boughs by the wind to pass from tree to tree. They feed entirely on leaves and young shoots and fruits, which they gather in their mouth, the fore-limbs aiding in dragging boughs within reach, but not being used as hands, as they are by monkeys, squirrels, etc. When sleeping they roll themselves up in a ball, and, owing to the dry shaggy character of their hair, are very inconspicuous among the mosses and lichens with which the trees of their native forests abound; and the concealment thus afforded is heightened in some species by the peculiar greenish tint of the outer covering—very uncommon in mammals.

SLOUGH, an urban sanitary district of Buckinghamshire, England, is situated on the Great Western railway, eighteen and one-half miles west of London and two north of Windsor. The population of the urban sanitary district, which embraces parts of the parishes of Stoke Poges and Upton-cum-Chalvey, in 1871 was 4,509, and in 1881 (area, 401 acres) it was 5,095.

SLOVAKS. See Slavs.

SLOVENES. See Slavs.

SLUG. See Snail.

SLUTSK, a district town of Russia, in the government of Minsk, situated on the Slutcha river (tributary of the Pripet), 123 miles south of Minsk. Its population remains almost stationary and was 19,000 in 1883.

SMALLPOX, or Variola (*varus*, "a pimple"), an acute infectious disease characterized by fever and by the appearance on the surface of the body of an eruption, which, after passing through various stages, dries up, leaving more or less distinct cicatrices.

Much obscurity surrounds the early history of smallpox. It appears to have been imported into Europe from Asia, where it had been known and recognized from remote antiquity. The earliest accounts of its existence reach back to the middle and end of the sixth century, when it was described by Procopius and Gregory of Tours as occurring in epidemic form in Arabia, Egypt, and the south of Europe.

The only known factor in the origin of smallpox is contagion—this malady being probably the most contagious of all diseases. Its outbreak in epidemic form in a locality may frequently be traced to the introduction of a single case from a distance. The most direct means of communicating smallpox is inoculation (see below). By far the most common cause of conveyance of the disease, however, is contact with the persons or the immediate surroundings of those already affected. The atmosphere around a smallpox patient is charged with the products of the disease, which likewise cling tenaciously to clothing, furniture, etc. The disease is probably communicable from its earliest manifestations onward to its close, but it is generally held that the most infectious period extends from the appearance of the eruption till the drying up of the pustules. Smallpox may also readily be communicated by the bodies of those who have died from its effects. No age is exempt from susceptibility to smallpox. Infants are occasionally born with the eruption or its marks upon their bodies, proving that they had undergone the disease *in utero*. Dark-skinned races are said to suffer more readily and severely than whites. One attack of smallpox as a rule confers immunity from any recurrence, but there are numerous exceptions to this rule. Overcrowding and all insanitary surroundings favor the spread of smallpox where it has broken out; but the most influential condition of all is the amount of protection afforded to a community by previous attacks and, especially in the present day, by vaccination.

While the symptoms of smallpox are essentially the same in character in all cases, they are variously modified according to the form which the disease may assume, there being certain well-marked varieties of this as of most other infectious maladies. The following description applies to an average case. After the reception into the system of the smallpox contagion the onset of the symptoms is preceded by a period of incubation, during which the patient may or may not complain. This period is believed to be from about ten to fourteen days. In cases of direct inoculation of the virus it is considerably shorter. The invasion of the symptoms is sudden and severe, in the form of a rigor followed by fever (the *primary fever*), in which the temperature rises to 103° or 104° Fahr. or higher, notwithstanding that perspiration may be going on. A quick pulse is present, together with thirst and constipation, while intense headache accompanied with vomiting and pain in the back is among the most characteristic of the initial symptoms. Occasionally the disease is ushered in by convulsions. Some authorities hold that the more violent the invasion the more severe the attack is likely to prove. These symptoms continue with greater or less intensity throughout two entire days, and during their course there may occasionally be noticed on various parts of the body, especially on the lower part of the abdomen and inner sides of the thighs, a diffuse redness accompanied by slight spots of extravasation (*petechiæ*), the appearance somewhat resembling that of scarlet fever. These "prodromal rashes," as they are termed, appear to be more frequent in some epidemics than in others, and they do not seem to have any special significance. They are probably more frequently seen in the cases of the mildest form of smallpox (varioloid). On the third day the characteristic eruption begins to make its appearance. It is almost always first seen on the face, particularly about the forehead and roots of the hair, in the form of a general redness; but upon this surface there may be felt by the finger numerous elevated points more or less thickly set together. The eruption; which is accompanied by heat and itching, spreads over the face, trunk, and extremities in the course of a few hours—continuing, however, to come out more abundantly for one or two days. It is always most marked on the exposed parts; but in such a case as that now described the individual "pocks" are separated from each other (discrete).

On the second or third day after its appearance, the eruption undergoes a change—the pocks becoming vesicles filled with a clear fluid. These vesicles attain to about the size of a pea, and in their center there is a slight depression, giving the characteristic umbilicated appearance to the pock. The clear contents of these vesicles gradually become turbid, and by the eighth or ninth day they are changed into pustules containing yellow matter, while at the same time they increase still further in size and lose the central depression. Accompanying this change there are great surrounding inflammation and swelling of the skin, which, where the eruption is thickly set, produce much disfigurement and render the features unrecognizable, while the affected parts emit an offensive odor, particularly if, as often happens, the pustules break. The eruption is present not only on the skin but on mucous membranes, that of the mouth and throat being affected at an early period; and the swelling produced here is not only a source of great discomfort, but even of danger from the obstruction thus occasioned in the upper portion of the air-passages. The voice is hoarse and a copious flow of saliva comes from the mouth. The mucous membrane of the nostrils is similarly affected, while that of the eyes may also be involved, to the danger of permanent impairment of sight. The febrile symptoms which ushered in the disease undergo marked abatement on the appearance of the eruption on the third day, but on the eighth or ninth, when the vesicles become converted into pustules, there is a return of the fever (*secondary* or *suppurative fever*), often to a severe extent, and not infrequently accompanied by prominent nervous phenomena, such as great restlessness, delirium, or coma. On the eleventh or twelfth day the pustules show signs of drying up (desiccation), and along with this the febrile symptoms decline. Great itching of the skin attends this stage. The scabs produced by the dried pustules gradually fall off and a reddish brown spot remains, which, according to the depth of skin involved in the disease, leaves a permanent white depressed scar—this "pitting" so characteristic of smallpox being specially marked on the face. Convalescence in this form of the disease is as a rule uninterrupted.

There are certain varieties of smallpox depending upon the form it assumes or the intensity of the symptoms. *Confluent smallpox* (*variola confluens*), while essentially the same in its general characteristics as the form already described, differs from it in the much greater severity of all the symptoms even from the onset, and particularly in regard to the eruption, which, instead of showing itself in isolated pocks, appears in large patches run together, giving a blistered aspect to the affected skin. This confluent condition is almost entirely confined to the face, and produces shocking disfigurement, while subsequently deep scars remain and the hair may be lost. The mucous membranes suffer in a similar degree of severity, and dangerous complications may arise from the presence of the disease in the mouth, throat, and eyes. Both the primary and secondary fevers are extremely severe. The mortality is very high, and it is generally estimated that at least 50 per cent. of such cases prove fatal, either from the violence of the disease or from one or other of the numerous complications which are specially apt to attend upon it. Convalescence is apt to be slow and interrupted. Another variety is that in which the eruption assumes the *hemorrhagic* form owing to bleeding taking place into the pocks after their formation. This is apt to be accompanied with hemorrhages from various mucous surfaces (particularly in the case of females), occasionally to a dangerous degree and with symptoms of great prostration. Many of such cases prove fatal. A still more serious form is that termed *malignant smallpox*, in which, as in the malignant forms of other infectious diseases (see MEASLES and SCARLET FEVER), the patient is from the onset overwhelmed with the poison and quickly succumbs—the rash scarcely, if at all, appearing or showing the hemorrhagic or purpuric character. Such cases are, however, comparatively rare. The term *varioloid* or *modified smallpox* is applied to the cases occurring in persons constitutionally but little susceptible to the disease, or in whom the protective influence of vaccination or a previous attack of smallpox still to some extent exists. Cases of this mild kind are of very common occurrence where vaccination has been systematically carried out.

The most important of all the conditions tending to affect the mortality from smallpox, alike in the individual and the community, is the protection afforded by VACCINATION, (*q.v.*) During the first decade of life, if vaccination has been fully and successfully accomplished in infancy, the risk of death from smallpox is *nil;* but, should the disease be caught—which is improbable—it will in all likelihood show itself in the mild form of varioloid. As regards revaccination, it has been found in all smallpox hospitals that the attendants and nurses escape the disease when revaccinated. The special treatment applicable to a person suffering from smallpox includes in the first place the providing competent nurses, who, together with all others in the neighborhood of the patient, should be duly protected by recent vaccination. The patient should lie on a soft bed in a well-ventilated but somewhat darkened room and be fed with the lighter forms of nutriment, such as milk, soups, etc. The skin should be sponged occasionally with tepid water, and the mouth and throat washed with a solution of chlorate of potash, Condy's fluid, or other safe disinfectant. In a severe case, with evidence of much prostration, stimulants may be advantageously employed. The patient should be always carefully watched, and special vigilance is called for where delirium exists. This symptom may sometimes be lessened by sedatives, such as opium, the bromides, or chloral. With the view of preventing pitting many applications have been proposed, but probably the best are cold or tepid compresses of light weight kept constantly applied over the face and eyes. The water out of which these are wrung may be a weak solution of carbolic or boracic acid. When the pustules have dried up the itching this produces may be much relieved by the application of oil or vaseline. Complications are to be dealt with as they arise and the severer forms of the disease treated in reference to the special symptoms presented. In cases where the eruption is tardy of appearing and the attack threatens to assume the malignant form, the writer has seen marked benefit attend the use of the wet pack. Disinfectants should be abundantly employed in the room and its vicinity, and all clothing, etc., in contact with the patient should be burnt.

SMART, Christopher, English poet, was born at Shipbourne in Kent, on April 11, 1722. In 1771 Smart died from the effects of poverty and disease.

SMEATON, John, English civil engineer, the son of an attorney, was born at Austhorpe Lodge, near Leeds, on June 8, 1724. He became apprentice to a philosophical instrument maker, and in 1750 set up in business on his own account. Besides improving various mathematical instruments used in navigation and astronomy, he carried on several experiments in regard to other mechanical appliances, among the most important being a series on which he founded a paper—for which he received the Copley medal of the Royal Society in 1759—entitled *An Experimental Inquiry concerning the Native Powers of Water and Wind to turn Mills and other Machines depending on a Circular Motion.* In 1754 he made a tour of the Low Countries to study the great canal works of foreign engineers. Already by his papers read before the Royal Society and his intercourse with scientific men his abilities as an engineer had become well known, and in 1756 application was made to him to reconstruct the Eddystone lighthouse, which had been burnt down in December of the previous year. In order to prepare an account of the various works on which he had been engaged as an engineer, Smeaton resolved to retire from his profession, but he only lived to complete in 1791 his *Narrative of the Building of Eddystone Lighthouse.* He died at Austhorpe, October 28, 1792, and was buried in the old parish church of Whitkirk.

SMELL is a sensation excited by the contact with the olfactory region of certain substances, usually in a gaseous condition and necessarily in a state of fine subdivision. The sense is widely distributed throughout the animal kingdom. The lower animals, especially those breathing in water, become cognizant of the presence of odoriferous matter near them without touch, vision, or hearing, and we suppose that they do so by some sense of taste or smell, or a combination of both. In such cases smell has been appropriately termed "taste at a distance," by which is meant that particles of matter may be diffused through the water so as to come into contact with the terminal organ and give rise to a sensation such as would have been excited had the matter from which the particles emanated come directly into contact with the nerve-endings. It is therefore of no great importance whether such sensations in humble aquatic organisms are termed taste or smell. In the higher air-breathing animals, however, the senses are differentiated: that of taste is found at the entrance of the alimentary canal, while that of smell guards the opening of the respiratory tract. This view assists in the interpretation of various structures met with in the lower forms which have been fairly regarded by naturalists as olfactory organs.

The sense of smell reaches its highest development in *Mammalia.* The anatomical surface is enormously extended in many cases, not only by the complication of the ethmoidal labyrinth, but also by the nasal passages communicating with spaces in the neighboring cranial and facial bones. The olfactory nerves are also very numerous and arise from a special encephalic center. They pass out of the skull by numerous holes in the cribriform or sieve-like plate of the prefrontal bone, which, on account of this peculiarity, is called the ethmoid bone. These nerves ramify on the olfactory membrane, covering the upper or ethmo-turbinal bones. The cavity containing the organ of smell is bounded by the prefrontal, vomerine, nasal, sphenoid, pterygoid, palatine, maxillary, and premaxillary bones, and it is usually in connection with air-cavities or sinuses in many or all of the bones of the skull. The median partition by which the two nostrils are formed consists of bone and cartilage and is built up by processes of the prefrontals, the vomer, and by the ridges of the nasals, palatines, maxillaries, and premaxillaries with which the vomer articulates. Each passage thus formed is the beginning of the respiratory tract, and is continued forward into a more or less mobile part called a nose, snout, or proboscis, while posteriorly it communicates with the upper part of the pharynx, into which opens the windpipe. On the outer wall there are three turbinal bones—superior, middle, and inferior—dividing partially the nasal cavity into three meatuses or passages. The superior meatus is between the superior and middle turbinated bones, the middle meatus between the middle and inferior turbinated bones, and the inferior meatus between the inferior turbinated bones and the floor of the nose.

Special Physiology of Smell.—It is necessary that the air containing the odor be driven forcibly against the membrane. Thus the nostrils may be filled with eau de Cologne, or with air impregnated with sulphuretted hydrogen, and still no odor is experienced if the person does not breathe. When a sniff is made the air within the nasal passages is rarefied, and, as the air rushes in to equilibrate the pressure, it is forcibly propelled against the olfactory surface. The olfactory surface must be moist; if it is dry, or is covered with too thick a layer of mucus (as in catarrh), the sense is much weakened or lost. The first moment of contact is the most acute, and the sense quickly becomes blunted. The first scent of a flower is the strongest and sweetest; and after a few minutes' exposure the intensity of even a fetid odor may not be perceived. This fact may be accounted for on the supposition that the olfactory membrane becomes quickly coated with a thin layer of matter, and that the most intense effect is produced when the odoriferous substances are applied to a clean surface.

SMELT. See Salmonidæ.

SMETHWICK, an urban sanitary district of Staffordshire, England, on the borders of Worcestershire and Warwickshire, is situated on the Birmingham, Dudley and Wolverhampton canal, and on branches of the London and North-Western and the Great Western railway lines, three miles west from Birmingham, of which the town of Smethwick is a suburb. The population of the urban sanitary district in 1871 was 17,158, and in 1881 (area, 1,882 acres) it had increased to 25,084.

SMIRKE, Robert, subject painter, was born at Wigton, England, near Carlisle in 1752. In 1791 Smirke was elected an associate of the Royal Academy, and two years later a full member. In 1814 he was nominated keeper to the Academy, but the king refused to sanction the appointment on account of the artist's pronounced revolutionary opinions. He died in London on January 5, 1845.

SMITH, Adam, the greatest of political economists, was the only child of Adam Smith, comptroller of the customs at Kirkcaldy in Fifeshire, Scotland, and of Margaret Douglas, daughter of Mr. Douglas of Strathendry, near Leslie. He was born at Kirkcaldy on June 5, 1723, some months after the death of his father. He received his early education in the school of Kirkcaldy under David Miller, among whose pupils were many who were afterward distinguished men.

Smith showed as a boy great fondness for books and remarkable powers of memory. He was sent in 1737 to the university of Glasgow, where he attended the lectures of Doctor Hutcheson; and in 1740 he went to Baliol College, Oxford.

In 1762 the senatus academicus of Glasgow conferred on him the honorary degree of doctor of laws. In 1763 he was invited to take charge of the young duke of Buccleuch on his travels. He accepted the proposal, and resigned his professorship. He went abroad with his pupil in March, 1764; they remained only a few days at Paris and then settled at Toulouse, then the seat of a parliament, where they spent eighteen months in the best society of the place, afterward making a tour in the south of France and passing two months at Geneva. Returning to Paris about Christmas of 1765, they remained there till the October of the following year. The period was one of intellectual and social ferment, and Smith was brought into relation with the most eminent persons of the time. In October, 1766, tutor and pupil returned home, and they ever afterward retained strong feelings of mutual esteem. For the next ten years Smith lived with his mother at Kirkcaldy, only paying occasional visits to Edinburgh and London; he was engaged in close study during most of this time, but unbent his mind in familiar intercourse with a few friends. He describes himself to Hume during this period as being extremely happy, comfortable, and contented. He was now occupied on his *Inquiry into the Nature and Causes of the Wealth of Nations*, which there is some reason for believing he had begun at Toulouse. That great work appeared in 1776.

The greater part of the two years which followed the publication of the *Wealth of Nations*, Smith spent in London, enjoying the society of the most eminent persons of the day, among whom were Gibbon, Burke, Reynolds, and Beauclerk. In 1778 he was appointed, through the influence of the duke of Buccleuch, one of the commissioners of customs in Scotland, and in consequence of this fixed his residence in Edinburgh. His mother, now in extreme old age, lived with him, as did also his cousin, Miss Jane Douglas, who assisted him in the care of his aged parent, and superintended his household. Much of his now ample income is believed to have been spent in secret charities, and he kept a simple, though hospitable, table, at which, "without the formality of an invitation, he was always happy to receive his friends." "His Sunday suppers," says M'Culloch, "were long celebrated at Edinburgh." One of his favorite places of resort in these years was a club of which Doctor Hutton, Doctor Black, Doctor Adam Ferguson, John Clerk, the naval tactician, Robert Adam, the architect, as well as Smith himself, were original members, and to which Dugald Stewart, Professor Playfair, and other eminent men were afterward admitted. Another source of enjoyment was the small but excellent library he possessed; it is still preserved in his family; Professor Nicholson has had access to it, and was struck by the varied nature of the collection, and especially by the large number of books of travel and poetry which it contained. In 1787 he was elected lord rector of the university of Glasgow, an honor which he received with "heartfelt joy." If we can believe a note in Wilberforce's *Correspondence*, he visited London in the spring of the same year, and was introduced by Dundas to Pitt, Wilberforce, and others. From the death of his mother in 1784, and that of Miss Douglas in 1788, his health and strength gradually declined, and after a tedious and painful illness, he died on July 17, 1790.

SMITH, ALBERT, an instance of the journalistic rather than the truly literary type of writer, was one of the most popular men of his time; a favorite humorist in the vein of humor then in vogue, but now already rather out of date; a leading contributor to *Punch;* the author of successful books of light social satire; and, not least, the exponent of "Mont Blanc" in the pre-scientific popular entertainment descriptive of that famous mountain. He was born at Chertsey, Surrey, England, on May 24, 1816. He died at Fulham, Middlesex, on May 23, 1860, from an attack of apoplexy.

SMITH, ALEXANDER, was the most prominent representative of the so-called "spasmodic" school of poetry, whose peculiarities first gained for it a hasty reputation, and then, having suffered under closer critical examination, it almost as speedily dropped out of mind again. Born at Kilmarnock, Scotland, on the last day of 1830, he died on January 5, 1867.

SMITH, COLVIN, portrait painter, was born at Brechin, Scotland, in 1795. He died in Edinburgh on July 21, 1875.

SMITH, HENRY JOHN STEPHEN, mathematician, was born in Dublin on November 2, 1826, and died at Oxford on February 9, 1883.

SMITH, JAMES and HORACE, sons of an eminent and prosperous London solicitor, were born, the former on February 10, 1775, and the latter on December 31, 1779, both in London. They were joint authors of the *Rejected Addresses*, described by Horace as "one of the luckiest hits in literature." The occasion of this happy *jeu d'esprit* was the rebuilding of Drury Lane theater in 1812, after a fire in which it had been burnt down. The managers had offered a prize of $250 for an address to be recited at the reopening in October. Six weeks before that date the happy thought occurred to the brothers Smith of feigning that the most popular poets of the time had been among the competitors, and issuing a volume of unsuccessful addresses in parody of their various styles. They divided the task between them, James taking Wordsworth, Southey, Coleridge, and Crabbe, while Byron, Moore, Scott, and Bowles were assigned to Horace. The parodists were ready with their small volume by October, but they had some difficulty in getting a publisher, although the success of their clever imitations once published was such that seven editions were called for within three months. The *Rejected Addresses* are the most widely popular parodies ever published in England, and have taken quite a classical rank in that kind of literature. The brothers fairly divided the honors; the elder brother's Wordsworth is evenly balanced by the younger's Scott, and both had a hand in Byron. A striking feature in the parodies is the absence of malice; none of the caricatured bards took offense, while the imitation is so clever that both Byron and Scott are recorded to have said in effect that they could hardly believe they had not written the addresses ascribed to them.

After this brilliant success James, the elder brother, determined, as he said, "to leave off a winner" and follow Warburton's advice to Anstey: "Young man, you have written a highly successful work, never put pen to paper again." He was tempted occasionally to transgress this self-denying ordinance and made another hit in writing *Country Cousins*, *A Trip to Paris*, *A Trip to America*, and other lively skits for Charles Mathews, earning from the comedian the praise of being "the only man who can write clever nonsense." He died in London on December 26, 1839.

Horace Smith was less timorously careful of his poetical reputation than his elder brother, whom he survived, and, after making a fortune as a stockbroker, followed in the wake of Scott and wrote about a score of historical novels—*Brambletye House*, *Tor Hill*, *Reuben Apsley*, *Zillah*, *The New Forest*, *Walter Colyton*, etc. His sketches of eccentric character are brilliant and amusing; but he was more of an essayist than a story-teller. Horace Smith died at Tunbridge Wells on July 12, 1849.

SMITH, JOHN, usually distinguished as Capt. John Smith, some time president of the English colony in Virginia, was the elder son of George Smith, a well-to-do tenant-farmer on the estate of Lord Willoughby d'Eresby at Willoughby near Alford in Lincolnshire, England. He was born (1580) in Willoughby in Lincolnshire, and was a scholar in the two free schools of Alford and Louth.

After the death of his father he was bound apprentice to a merchant, but when about fifteen years of age he ran away and went to France, thus beginning the ten years of adventure in Europe, Asia, and Africa, which he spent in military service under various leaders, and during which time fortune alternately smiled and frowned on him. At the expiration of ten years, when he was about twenty-five years old, he returned to England, and in that year (1605) his Virginia experiences began. Throwing himself into the colonizing projects which were then coming to the front, he first intended to have gone out to the colony on the Oyapok in South America; but, Captain Ley dying, and the reënforcement miscarrying, the rest escaped as they could. Hence Smith did not leave England on this account, but he went heartily into the Virginian project with Captain Bartholomew Gosnold and others. The expedition consisted of three ships (the *Susan Constant*, 100 tons, Captain C. Newport; the *God Speed*, 40 tons, Captain B. Gosnold; and a pinnace of 20 tons, Captain J. Ratcliffe), with about 140 colonists and 40 sailors. They made first for the West Indies, reaching Dominica on March 24, 1607. Sailing northward from the West Indies, not knowing where they were, the expedition was most fortunately, in a gale, blown into the mouth of Chesapeake Bay, discovering land on April 26, 1607. Anchoring, they found the James river, and, having explored it, fixed upon a site for their capital in the district of the chief or weroance of Paspaheh, its chief recommendation being that there were six fathoms of water so near to the shore that the ships could be tied to the trees. Orders had been sent out for the government of the colony in a box, which was opened on April 26, 1607. Captains B. Gosnold, E. M. Wingfield, C. Newport, J. Smith, J. Ratcliffe, J. Martin, and G. Kendall were named to be the council to elect an annual president, who, with the council, should govern. Wingfield was, on May 13th, elected the first president; and the next day they landed at James Town and commenced the settlement.

As in going to America in those days the great difficulty was want of water, so in those colonizing efforts the paramount danger was from want of food. "There were never Englishmen left in a foreign country in such misery as we were in this new discovered Virginia. We watched every three nights [every third night], lying on the bare cold ground, what weather soever came, and warded all the next day, which brought our men to be most feeble wretches. Our food was but a small can of barley sodden in water to five men a day. Our drink, cold water taken out of the river, which was, at a flood, very salt, at a low tide, full of slime and filth, which was the destruction of many of our men." So great was the mortality that out of 105 colonists living on June 22, 1607, 67 died by the following January 8th. The country they had settled in was sparsely populated by many small tribes of Indians, who owned as their paramount chief, Powhatan, who then lived at Werowocomoco, a village on the Pamunkey river, about twelve miles by land from James Town. Various boat expeditions left James Town, to buy food in exchange for copper. They generally had to fight the Indians first, to coerce them to trade, but afterward paid a fair price for what they bought.

On December 10, 1607, Captain Smith, of whom it is said, "the Spaniard never more greedily desired gold than he victail," with nine men in the barge, left James Town to get more corn, and also to explore the upper waters of the Chickahominy. They got the barge up as far as Apocant. Seven men were left in it, with orders to keep in midstream. They disobeyed, went into the village, and one of them, George Cassen, was caught; the other six, barely escaping to the barge, brought it back to James Town. It so happened that Opecanchanough (the brother of Powhatan, whom he succeeded in 1618, and who carried out the great massacre of the English on Good Friday, 1622) was in that neighborhood with two or three hundred Indians on a hunting expedition. He ascertained from Cassen where Smith was, who, ignorant of all this, had, with Jehu Robinson and Thomas Emery, gone in a canoe twenty miles farther up the river. The Indians killed Robinson and Emery while they were sleeping by the camp fire, and went after Smith, who was away getting food. They surprised him, and, though he bravely defended himself, he had at last to surrender. He then set his wits to confound them with his superior knowledge, and succeeded. Opecanchanough led him about the country for a wonder, and finally, about January 5, 1608, brought him to Powhatan at Werowocomoco. "Having feasted him after their best barbarous manner they could, a long consultation was held; but the conclusion was two great stones were brought before Powhatan; then as many as could laid hands on Smith, dragged him to them, and thereon laid his head. And, being ready with their clubs to beat out his brains, Pocahontas, the king's dearest daughter, when no entreaty could prevail, got his head in her arms and laid her own upon his to save him from death. Whereat the emperor was contented Smith should live, to make him hatchets, and her bells, beads, and copper; for they thought him as well of all occupations [handicrafts] as themselves."

Meanwhile the establishment of this forlorn hope in Virginia had stirred up a general interest in England, so that the London Company were able in June, 1609, to send out nine ships with 500 colonists. Smith had now got the Indians into splendid order; but from the arrival on August 11 of the newcomers his authority came to an end. They refused to acknowledge him, and robbed and injured the Indians, who attacked them in turn. Smith did his best to smooth matters, while the rioters were plotting to shoot him in his bed. In the meantime he was away up the river. On his return, "sleeping in his boat, accidentally one fired his powder bag, which tore his flesh from his body and thighs, nine or ten inches square, in a most pitiful manner; but to quench the tormenting fire frying him in his clothes he leaped overboard into the deep river, where, ere they could recover him, he was nearly drowned." Thus disabled, he was sent home on October 4, 1609, and never set foot in Virginia again. Nemesis overtook the rioters the winter after he left, which is known in Virginian story as "the starving time." Out of 490 persons in the colony in October, 1609, all but 60 died by the following March.

The rest of Smith's life can only be briefly touched upon. The period, 1610–1617, was chiefly spent in discovering Nusconcus, Canada, and Pemaquid in North Virginia, to which, at his solicitation, Prince

Charles gave the name of New England. His first object was to fish for cod and barter for furs, his next, to discover the coast-line with the view to settlement. Two attempts, in 1615 and in 1617, to settle at Capawuck failed, but through no fault of his.

The last period, 1618–1631, of Smith's life was chiefly devoted to authorship. In 1618 he applied (in vain) to Lord Bacon to be numbered among his servants. In 1619 he offered to lead out the pilgrim fathers to North Virginia; but they would not have him, he being a Protestant and they Puritans. The London Virginia Company became bankrupt for $1,000,000 in 1624. Thus having done much, endured much, and written much, while still contemplating a *History of the Sea*, Captain John Smith died on June 21, 1631, and was buried in St. Sepulchre's Church, London.

SMITH, John Raphael, English painter and mezzotint engraver, a son of Thomas Smith, of Derby, the landscape painter, was born in 1752, and died March 2, 1812.

SMITH, Joseph. See Mormons.

SMITH, Sydney, one of the founders of the Edinburgh *Review*, and one of the wittiest talkers and political writers of his generation, was the son of an English country gentleman, and was born at Woodford, in Essex, England, on June 3, 1771.

Most of Sydney Smith's contributions to the Edinburgh *Review* were sent from the country parish of Foston-le-Clay, in Yorkshire, where he spent the best part of his life. He left Edinburgh for good in 1803, and, yielding to his wife's confidence in his powers—he had married Miss Pybus, an English lady of good family, while still unsettled in life—adventured on London, where he rapidly became known as a preacher, a lecturer, and a social lion. His success as a preacher, although so marked that there was often not standing room in the church in Berkeley Square, where he conducted the morning service, was not gained by any sacrifice of dignity; there was no eccentricity, nothing sensational in his preaching; it was a pure triumph of good sense, right feeling, earnestness, and freshness of pulpit oratory. He lectured on moral philosophy at the Royal Institution for three seasons, from 1804 to 1808; and here also, handling the ordinary topics of a philosophy chair in a Scotch university, he treated them with such vigor, freshness, and liveliness of illustration that the London world crowded to Albemarle street to hear him. With the brilliant reputation that Sydney Smith had acquired in the course of a few seasons in London, he would probably have obtained some good preferment had he been on the powerful side in politics. His Whig friends came into office for a short time in 1806, and presented him with the living of Foston-le-Clay, in Yorkshire. He shrank from this banishment for a time, and discharged his parish duties through a curate; but Mr. Percival's Residence Act was passed in 1808, and, after trying in vain to negotiate an exchange, he quitted London in 1809 and moved his household to Yorkshire. His most famous single production, *Peter Plymley's Letters* on the subject of Catholic emancipation, ridiculing the opposition of the country clergy, appeared before this migration.

Sydney Smith, after twenty years' service in Yorkshire, obtained preferment at last from a Tory minister, Lord Lyndhurst, who presented him with a canonry in Bristol cathedral in 1828, and afterward enabled him to exchange Foston for the living of Combe Florey near Taunton. From this time he discontinued writing for the *Edinburgh Review* on the ground that it was more becoming in a dignitary of the church to put his name to what he wrote. His *Letters to Archdeacon Singleton* on the Ecclesiastical Commission (1837), and his *Petition* and *Letters* on the repudiation of debts by the State of Pennsylvania (1843), are as bright and trenchant as his best contributions to the *Edinburgh Review*. Smith died in London on February 22, 1845.

SMITH, Sir Thomas, the contemporary and friend of Sir John Cheke, was born at Saffron Walden in Essex, England, in 1512, and died in 1577.

SMITH, William, called "the father of English geology," and among his acquaintances "Stratum Smith," will be generally remembered as the framer and author of the first complete geological map of England and Wales, and as the discoverer of the principle of the identification of strata by their included organic remains. He was born at Churchill in Oxfordshire, England, on March 23, 1769.

On being appointed engineer to the Somerset Coal Canal in 1794, he was deputed to make a tour of observation with relation to inland navigation. During this tour, which occupied nearly two months, and extended over 900 miles, he carefully examined the geological structure of the country, and corroborated his preconceived generalization of a settled order of succession in the several strata, a continuity of range at the surface, and a general declination eastward. Five years subsequently he prepared a tabular view of the *Order of the Strata, and their embedded Organic Remains, in the neighborhood of Bath, examined and proved prior to 1799*. From this period to 1812 he was completing and arranging the data for his large *Geological Map of England and Wales, with part of Scotland*, which appeared in 1815. In January, 1831, the Geological Society of London conferred on Smith the first Wollaston medal; and the government, at the request of several English geologists, conferred upon him a life-pension of $500 per annum. The degree of LL.D. he received from Dublin, at the meeting of the British Association in that city in 1835. In 1838 he was appointed one of the commissioners to select building stone for the new Houses of Parliament. The last years of his life were spent at Hackness (of which he made a good geological map), near Scarborough, and in the latter town. His usually robust health failed in 1839, and on August 28th of that year he died at Northampton.

SMITH, William Henry, was born in 1808, and is best known as the author of *Thorndale*. His more exact contributions to thought, such as the *Discourse on the Ethics of the School of Paley* and the *Essays on Knowing and Feeling*, do not work out anything like a complete system, and are somewhat lacking in intellectual grip. Smith also wrote several books of verse, and two plays, one of which, *Athelwold*, was produced by Macready in 1842. His first writings appeared in the *Literary Gazette* and in the *Athenæum*, to which he contributed under the name of "Wool-gatherer," attracting some attention by the delicacy and finish of his style. *Ernesto*, a philosophical romance, also belongs to this early period. In 1836 he wrote for the *Quarterly Review*, and in 1839 he formed a connection with *Blackwood's Magazine*, which lasted for thirty years, during the latter part of which he acted as its philosophical critic. In 1846 a visit to Italy led to the writing of a tale entitled *Mildred*, which was too purely reflective to be successful. In 1851 he declined the chair of moral philosophy at Edinburgh, having determined a year or two previously to retire to the English Lake district, there to study in seclusion. There he completed *Thorndale*, which was published in 1857. *Gravenhurst* appeared in 1862. He died at Brighton on March 28, 1872.

SMITH, Sir William Sidney, English admiral, was the second son of Capt. John Smith of the Guards, and was born at Westminster July 21, 1764. He entered the navy, according to his own account, "at the beginning of the American War," being only about eleven years of age. For his bravery under Rodney in the action near Cape St. Vincent, in January, 1780, he was on September 25th appointed lieutenant of the *Alcide*. After serving in the actions against the French fought by Graves off Chesapeake, in 1781, and by Rodney at the Leeward Islands, in 1782, he was on May 6th of the latter year promoted to be commander of the *Fury* sloop, and October 18th advanced to the rank of captain. From 1790 to 1792 he was employed in advising the king of Sweden in the war with Russia, receiving for his services the honor of knighthood. After his return to England he was sent on a mission to Constantinople, and, having joined Lord Hood at Toulon from Smyrna in December, 1793, he burnt the enemy's ships and arsenal. In the following year he cleared the Channel of French privateers; but, having with the boats of his squadron boarded in Havre-de-Grâce harbor a lugger which was driven by the tide above the French forts, he was, April 19, 1796, compelled to surrender and was sent a prisoner to Paris. By means of forged orders for his removal to another prison he made his escape from the Temple, and, crossing the Channel in a small skiff picked up at Havre, arrived in London on May 8, 1798. In October he was sent as plenipotentiary to Constantinople. Learning of Buonaparte's approach to St. Jean d'Acre, he hastened to its relief, and on March 16, 1799, captured the enemy's flotilla, after which he successfully defended the town against several furious attacks of the French, compelling Napoleon on May 20th to raise the siege and retreat in disorder, leaving all his artillery behind. For this brilliant exploit he received the special thanks of the Houses of Parliament and was awarded an annuity of $5,000. Subsequently he coöperated with Abercromby, under whom he served as brigadier-general at the battle of Aboukir, where he was wounded. On his return to England he was, in 1802, elected M.P. for the city of Rochester. On July 31, 1810, he was made vice-admiral of the blue, and on July 18, 1812, was dispatched as second in command under Sir Edward Pellew to the Mediterranean, but the expedition was uneventful. His term of active service practically closed in 1814. He was made K.C.B. in 1815, and in 1821 admiral. The later years of his life were spent at Paris, where he died on May 26, 1840.

SMITHSONIAN INSTITUTION (see JAMES SMITHSON). The origin and creation of the Smithsonian Institution at Washington is due to the munificence of James Smithson, an English scientist of distinguished attainments and magnificent liberality. He died at Genoa in 1829. By the terms of his will the sum of $500,000 was to be paid to the United States Government "to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." Mr. Smithson was the son of James Smithson, the first duke of Northumberland, and was born in 1765. For many years he was known as James Lewis Macie, the latter being the name of his mother, but he adopted Smithson about 1800. He was graduated at Pembroke college in 1786, was admitted as a member of the Royal Society in 1787, and thereafter pursued a successful career as a scientist, devoting his special attention to chemistry. He was the contemporary of Humphrey Davy, and the author of frequent articles on scientific subjects, published in the scientific journals of the day, that not only demonstrated his complete mastery of the subject, but extended and confirmed his already established reputation. The unselfish liberality of which Smithson was the author has, during the period that has elapsed since his death, stimulated the development of a similar spirit, particularly in the United States, where donations and bequests for the establishment of schools, libraries, observatories, and other public benefits have been of frequent occurrence.

The Smithson bequest was accepted by Congress, June 1, 1836, and in September, 1838, the original amount, meanwhile having increased to $515,169, was paid into the United States treasury.

The application of the fund to the purposes designated by Mr. Smithson was provided for by an act of Congress adopted August 10, 1846, by the terms of which the building of the institution, together with the means for its support and its direction and management, were fully determined. The trust has since been administered by a board of regents, consisting of the chief-justice of the Supreme Court of the United States, three senators, and three representatives in Congress appointed by the vice-president and speaker of the House, respectively, and six citizens selected by Congress. The latter serve six years, representatives two years, and senators during their term of office. The board convenes annually in January, and through its secretary, who is also secretary of the institution, makes its report to Congress. In addition to the regents there is a board of visitors composed of the president and vice-president of the United States, members of the cabinet, and distinguished men selected from the various States. The fund since its receipt has been carefully invested in interest-bearing securities, and these have been managed with such regard to a faithful execution of the duties imposed by the trust, that not only was the building erected out of the interest, but a large addition from the same source has since been made to the amount of the original bequest.

The building was contracted for in 1846, the corner stone laid with impressive ceremonies May 1, 1847, and its completion reached early in the fifties. The institution occupies a prominent site on Washington avenue near Tenth street, Washington City, and is 450 x 140 feet in dimensions. It is built of red sandstone, quarried near Washington, and presents an exterior both elegant and finished, as also displaying to excellent advantage the Romanesque style of architecture adopted in its construction. The edifice consists of the main building with a connecting wing on each side. The first story of the former is occupied as a hall, audience room, etc., while the wings are used for purposes connected with scientific investigation. Nine towers from 37 to 140 feet in height give to the building an appearance additionally impressive. Adjoining the institution, an edifice of very considerable dimensions has been erected for the accommodation of scientific materials and other features connected with the equipments of the service, belonging to the United States and deposited in the United States Museum, the direction of which is coupled with that of the institution and was formerly supported by its funds, but is now maintained by the government.

During January, 1865, a portion of the western extension, together with a part of the center of the main building, was partially burned, involving the loss of a large amount of property that can never be replaced, including what was known as the Stanley gallery of Indian paintings. The burned premises were subsequently restored from the income of the fund; and departments connected with the institution, such as the art collections, herbarium and entomological collections, etc., have since been removed from the building proper, the art collection to the Corcoran gallery, the library, consisting of from 75,000 to 100,000 volumes, to the natural science section of the library of Congress, the herbarium to the Department of Agriculture, and the meteorological observations to the Weather Bureau.

Thus relieved of the care of departments that, in a measure, were foreign to the original purpose of the institution, its fund has since been exclusively appropriated to the investigation of science and the dissemination of the results of such investigation and study. This is done through publications issued at regular intervals, and made up of the *Smithsonian Contributions to Knowledge*, begun in 1848, the *Smithsonian Miscellaneous Collections*, and the *Annual Report of the Smithsonian Institution.* In addition to these the institution has charge of the National Museum and Bureau of Ethnology publications, also of those of the "Philosophical Society" of Washington. Of late years the investigations of the United States Fish Commission have been conducted with the assistance of the secretary of the institution.

Those in a position to know declare that the present force employed at the institution is insufficient in number to handle the material received during the year, and recommend an increase of the scientific corps. Prof. S. P. Langley, recently in charge of the Allegheny City Astronomical Observatory, assisted by G. Brown Goode, formerly of the National Museum, were appointed secretary and assistant secretary as successor to Prof. Spencer F. Baird, who was made assistant secretary in 1850, and secretary upon the death of Prof. Joseph Henry, the first secretary of the institution, which occurred in 1878.

The present board of regents is composed of Chief-justice Melville W. Fuller, Vice-president Levi P. Morton, Senators Randall Lee Gibson, Shelby M. Cullom, and J. S. Morrill; Representatives Joseph W. Wheeler and W. W. Phelps; Henry Coppie, Pennsylvania; Noah Porter, Connecticut; James C. Welling, and M. C. Meigs, of Washington city; J. B. Angell, Michigan; and D. White, New York. The president of the United States is *ex-officio* president of the board, and the chief justice of the Supreme Court *ex-officio* chancellor.

SMOKE ABATEMENT. The nuisance created by coal smoke seems to have been recognized in London as early as the reign of Queen Elizabeth; but it is only in more modern times that the question has come to be regarded as one of real practical importance, and even yet it is far from receiving that general attention which it demands. In 1785 the first smoke-abating invention was patented by James Watt, who, as the inventor of the steam-engine, is responsible for so many boiler fires and so much consumption of coal. In 1815 Cutler patented the first would-be smokeless grate for domestic purposes. In 1819 the attention of parliament was directed to the question, and a select committee was appointed "to inquire how far persons using steam-engines and furnaces could erect them in a manner less prejudicial to public health and comfort." This committee gave an encouraging report. In 1843 another select committee recommended the introduction of a bill prohibiting the production of smoke from furnaces and steam-engines. In 1845 yet another select committee reported that such an act could not in the existing state of affairs be made to apply to dwelling-houses. The Acts of 1845 and 1847 followed as the results of these inquiries; and since then there has been much legislation brought to bear on factories and railways. The results have been most beneficial; but very much still remains to be done. In 1881, however, a movement was commenced by the National Health Society and the Kyrle Society, which resulted in a great smoke-abatement exhibition being held at South Kensington. At the close of the exhibition a national smoke-abatement institution, with offices in London, was incorporated by authority of the Board of Trade.

A knowledge of the nature of coal and of the chemical changes that it undergoes when burnt is essential for an understanding of the smoke problem. More detailed information on these points is given under COAL, where the several varieties are described.

Two things are necessary for the insuring of complete combustion, viz., an adequate, but not too large, supply of air, properly administered, and the maintenance of the requisite temperature. In practice, however, these conditions are never perfectly fulfilled, and consequently the combustion of coal is always more or less imperfect and gives rise to a complex mixture of vapors. This mixture contains not only the combustion products already mentioned but also the following unburnt or partly burnt distillation products:—hydrogen, hydrocarbons, carbonic oxide, which contains a lower proportion of oxygen than carbonic acid, unburnt carbon in a very finely divided state—and also considerable volumes of unused air.

Usually the name "smoke" is applied to this vaporous mixture discharged from a chimney only when it contains a sufficient amount of finely divided carbon to render it dark-colored and distinctly visible. The quantity, however, of this particular ingredient is apt to be overrated. It always bears an extremely small proportion to the vast volumes of water-vapor, carbonic acid, and nitrogen with which it is mixed; it probably never amounts, even in the worst cases, to 3 per cent. of the weight of the coal from which it is formed; and its importance, reckoned in terms of so much fuel wasted, is certainly not greater than that of the unburnt hydrogen and hydrocarbons. It is perhaps best to use the name "smoke" for all the products of imperfect combustion which are avoidable, as constrasted with the necessary and unavoidable ingredients of the mixture. The problem of smoke abatement is thus seen to resolve itself into the problem of the production of perfect combustion.

The first advantage to be gained by the solution of this problem is an important saving in fuel. The second advantage to be looked for is a great gain in cleanliness and public convenience. Not only would there be an end to sooty chimneys but the atmosphere of towns would no longer be polluted as it is now by the discharge of unburnt carbon, whose total quantity is enormous, though the amount contained in any given puff of smoke is very small.

The methods that have been suggested for the abolition of smoke may be divided into two great classes, viz., those that seek to attain this end by improving the appliances for the burning of bituminous coal, and those that propose to abolish its use and substitute for it some other kind of fuel. The proposals of the first class may be divided into those applicable to domestic purposes and those applicable to boiler fires and other large-scale operations. Those of the second class may be divided according to the nature of the fuel which they suggest. The innumerable inventions of the first class depend for their success (so far as they are successful) on the attention bestowed on the scientific requisites for complete combustion, viz., a sufficient but not too great supply of air, the thorough admixture of this air with the products of the destructive distillation of the coal, and the maintenance of a high temperature within the fire. In the old and crude methods the facts which most militate against the attainment of these desiderata are—(1) that large masses of fresh fuel are continually being thrown on at the top, which cool down the fire just at that point where highest temperature is required; (2) that the products of the distillation of this fresh fuel, heated from below, do not get properly mixed with air till they have been drawn up the chimney; (3) that unduly large volumes of cold air are continually being sucked up through the fire, cooling it and carrying its heat away from where it is wanted, and yet without remedying the second evil. In the improved methods regularity of supply of both fuel and air is sought so as to maintain a steady evolution of distillation products, a steady temperature, and a steady and complete combustion.

We cannot here discuss the merits of individual inventions; but we may summarize the chief results of the tests applied at the South Kensington Exhibition. Domestic grates and stoves were divided into six classes as follows:—(1) open grates having ordinary bottom grids and upward draught; (2) open grates having solid floors (adapted for "slow combustion") and upward draught; (3) open grates fed from below—supplied with fresh fuel beneath the incandescent fuel; (4) open grates fed from the back or from the sides or from hoppers; (5) open grates having downward or backward or lateral draught; (6) close stoves. Each of these classes was subdivided according as the apparatus was "air-heating" or "non-air-heating," *i.e.*, according as an attempt was or was not made to save heat on the regenerative principle. This attempt does not appear to have been distinctly successful in any class except the fifth; indeed the evidence of the tests as a whole is rather against the air-heating principle.

Much attention has been devoted for many years to the question of how to work boiler fires, both for locomotives and for fixed appliances, with the least possible production of smoke and the greatest possible evaporative power. Here the desiderata are essentially the same as in the case of domestic fires, viz., adequate admixture of the combustible vapors given off by the coal with the necessary air and the maintenance of a high temperature; and the principles involved are consequently also the same, though the appliances are necessarily different. These improvements may be all classed under one or other of two heads, according as the mode of supplying the fuel or the mode of supplying the air is the subject of the improvement. These two kinds of improvement may of course be combined. The article FURNACE may be consulted; see also STEAM-ENGINE, sect. "Boilers."

It is generally recognized that air cannot be efficiently supplied to the furnace if admitted only in front, and accordingly there have been many plans devised for supplying it also at the back. In some cases currents of air are induced by steam-jets; but this plan has not proved very successful. The best inventions are on the regenerative principle. In them the air, before entering the furnace, is made to circulate through chambers heated externally by the products of combustion, and, having thus acquired a high temperature and absorbed heat that would otherwise have been lost, is admitted through openings at the bridge. Many of these appliances are almost absolutely smokeless, and they are much in use.

The advocates of the total or partial disuse of smoke-producing coals are variously in favor of the following substitutes—anthracite, coke, liquid fuel, and gas. For some purposes anthracite and other coals containing a high percentage of carbon may be, and have long been, advantageously used as fuel. They yield a much smaller percentage of distillation products than ordinary coals, and produce no smoke, or almost none. But they are difficult to ignite, and in small fires difficult to keep burning; they give very little flame, and are comparatively expensive, so that they are under considerable disadvantage as compared with the usual kinds of coal. Coke is produced in large quantities both for its own sake and as a by-product in the manufacture of gas for lighting purposes, and is largely used in various kinds of furnace. It gives no smoke; but it resembles anthracite also in being but ill adapted to use in open grates on account of the difficulty of ignition and the absence of flame. (See FUEL).

In America, where natural petroleum is obtained in such enormous quantities, the experiment has been made of using it as the source of heat for boilers. A jet of superheated steam (at about 600° Fahr.) is blown into the hot combustion chamber and the oil and air enter mixed with it. The results are said to be excellent—the fire smokeless and the efficiency high. The chief disadvantage attending the use of liquid fuels such as petroleum seems to lie in the fact that they are somewhat dangerous, fatal accidents having occurred in America; and the range of their application is necessarily limited. To use them for the heating of houses is of course quite out of the question.

Of all the schemes and inventions for the abatement of smoke that one which proposes to distill coal in one operation, and to burn the products of the distillation in another and quite separate operation, is without doubt the most thoroughly scientific; and to it, rather than to patent grates and furnaces, we must look for the ultimate solution of the question. Many arguments may be adduced in favor of gas-heating as opposed to coal-heating, the most important of which are here briefly given. (1) Coal gives, on distillation, not only gas and coke, which are both good heating agents, but intermediate products, many of which are of commercial value; these include ammonia, benzine, carbolic acid, anthracine, etc. (2) Gas can be laid on in pipes to any spot, can be lit or turned out at any moment, and can be so managed that less heat is frittered away and more applied to the specific object than in the case of coal-burning. (3) It produces no smoke and leaves no ash or cinder, so that cleanliness is attained and much labor and expense are saved. (4) The coke produced during the preparation of the gas has uses of its own as solid fuel and for other purposes. (5) As has been already said, sulphur is an ingredient of all coals, and sulphuric acid is one of the necessary results of burning them, not to be got rid of by "smoke abatement." Coal gas, however, can to a great extent be freed from sulphur compounds, and it is possible that the purification methods in vogue may hereafter be improved, so that we have here a means, if any exist, of curing the chief evils of our present system—injury to our respiratory organs, production of fogs, and destruction of vegetation in towns. The principal disadvantage of the proposal is to be found in the high cost of coal gas. There is no doubt, however, that the cost might, and it probably will, be brought down as the high rate is due to causes not inherent in the nature of things. It is probable that electricity will ultimately drive gas out of the field as an illuminating agent, and that it will then be relegated to its true place as a heating agent. When that is done coal will no longer be burnt as a whole, but only those of its products (gas and coke) which are good for heating and for nothing else.

As an example of what gaseous fuel can do, it may be mentioned that in Pittsburgh, Penn., the furnaces are now being fed by natural oil gas, and that that city, formerly one of the dirtiest of manufacturing towns, is now one of the cleanest.

SMOLENSK, a government of middle Russia, belonging partly to Great Russia and partly to White Russia, is bounded by Moscow and Kaluga on the east, Orel and Tchernigoff on the south, Moghileff and Vitebsk on the west, and Pskoff and Tver on the north.

It covers an area of 21,638 square miles in the west of the great central plateau, its northern districts extending toward the hilly region of the Valdais, where the flat-topped gentle declivities reach about 1,000 feet above the sea. The rivers being deeply cut in the plateau, the surface is also hilly in the western districts (Smolensk, Dorogobuzh), whence it slopes away gently toward immense plains on the east and south. The soil, mostly clay, is generally unfertile, and stony and sandy in several districts. Many large rivers belonging to the basins of the Volga, the Oka, the Dnieper, and the Dwina have their origin in Smolensk. The Vazuza and the Gzhat, both flowing into the Volga, and the Moskva and the Ugra, tributaries of the Oka, are channels for floating timber. The two tributaries of the Dwina—the Kasplya and the Mezha—are of much more importance, as they and their affluents carry considerable numbers of boats to Riga. The Dnieper takes its origin in Smolensk, and waters it for more than 300 miles. Many small lakes and extensive marshes occur in the northwest. One-third of the area is under forests. The population of Smolensk reached 1,191,172 in 1882, of whom only 106,133 lived in towns, and consists of White Russians in the west (46.7 per cent.), Great Russians in the east (42.6), and of a mixed population of both (10.4). Nearly 1,000 Jews and 1,000 Poles are scattered through the towns.

The climate is like that of middle Russia generally, although the moderating influence of the wet climate of western Europe is felt to some extent. Notwithstanding the unproductive soil and the frequent failures of crops (especially in the northwest), the chief occupation is agriculture. In 1884 3,040,000 acres were under crops, and 2,379,600 quarters of grain of various kinds were raised (2,930,400 in 1883)—the potato crop yielding 5,498,400 bushels. Nearly all the land is cultivated by the peasant communes—only 766,500 acres (out of 6,868,900) in the hands of single individuals being under cultivation. Oats are an important crop. Hemp and flax are largely raised and exported. Cattle-breeding stands at a low level; the cattle of the peasantry suffer from a want of meadow and pasture land, which is mostly in private ownership. The timber trade and boat-building are important sources of income, but do not furnish employment for all who are in need of it; more than one half of the male population of west Smolensk leave their homes every year in search of work, principally as navvies throughout Russia. The manufactures are developing but slowly, and in 1882 employed only about 5,100 workmen—their annual production being valued at $1,644,000; of this amount the distilleries yielded nearly one-third. A few cotton-mills in the east have a production valued at $310,800 per annum. A lively traffic is carried on on the rivers, principally the Kasplya, the Obzha, and the Ugra, where corn, hemp, hempseed, linseed, and especially timber are shipped to the amount of nearly $2,000,000 annually. A considerable quantity of corn is imported into the western districts. Smolensk is crossed by two important railways, from Moscow to Warsaw and from Riga to Saratoff; a branch line connects Vyazma with Kaluga. The educational institutions embrace eleven gymnasia and progymnasia (830 boys and 1,402 girls), and 394 primary schools (15,031 boys and 2,142 girls).

SMOLENSK, capital of the above government, is situated on both banks of the Dnieper, at the junction of the railways from Moscow to Warsaw and from Riga to Orel, 262 miles by rail west-southwest of Moscow. The town, with the ruins of its old kremlin, is built on the high crags of the left bank of the Dnieper, its suburbs extending around and on the opposite bank of the river. Smolensk is neither a commercial nor a manufacturing center; its population was 35,830 in 1882.

SMOLLETT, TOBIAS GEORGE, novelist, was born at Dalquhurn, in the valley of Leven, Dumbartonshire, in 1721. His father, the youngest son of the laird of Bonhill, a Scottish legal dignitary, married against the ambition of his family, and died young, leaving three children, of whom the future novelist was the second son, entirely unprovided for. The boy, being thus left dependent on the charity of relatives, grudgingly and insolently bestowed, as it seemed to him, learned to look with suspicion on kindly professions. He seems to have received the ordinary book education of the place and period. He was sent to the neighboring grammar-school of Dumbarton—taught at the time by one of the most eminent schoolmasters in Scotland—and thereafter to the university of Glasgow. He wished then to enter the army, as his elder brother had done, but much against his will was apprenticed to a surgeon. His grandfather died when he was in his eighteenth year, without leaving any provision for the children of his youngest son, and in his nineteenth year Smollett left Glasgow and launched himself on London in quest of fortune with the tragedy of the *Regicide* in his pocket. He failed to get the tragedy accepted, and, reduced almost to starvation, was fain to take the situation of surgeon's mate on board a ship of the line. He was present in 1741 at the siege of Cartagena. He soon quitted the navy in disgust, but during his service of a few years he acquired, as Scott says, "such intimate knowledge of our nautical world as enabled him to describe sailors with such truth and spirit of delineation that, from that time, whoever has undertaken the same task has seemed to copy more from Smollett than from nature."

Returning to England in 1746, Smollett made a desperate attempt to live by his pen, publishing the satires *Advice* and *Reproof*—satire being then in fashion—and pushing the *Regicide* and other dramatic works on theatrical managers and patrons. He revenged himself in his satires for the rebuffs given to his plays. His fierce and distempered mood when he wrote *Roderick Random* is reflected in the characters of the novel, which are drawn with a much more defiant and contemptuous hand than he used in any of his subsequent works. The public, however, when *Roderick Random* was published—in 1748, a few months before *Tom Jones*—did not concern themselves with the character of the author. This novel at once raised Smollett into reputation. It was followed after an interval of three years by *Peregrine Pickle* (1751), the immediate popularity of which was helped by the insertion into the body of the novel of two stories from real life, the memoirs of a lady of quality (Lady Vane) and the memoirs of the philanthropist M'Kercher. This second masterpiece was written with a much lighter heart than the first, although it must be confessed that the hero is not much of an improvement on "Roderick Random." Scott describes him as "the savage and ferocious Pickle, who, besides his gross and base brutality toward Emilia, besides his ingratitude to his uncle, and the savage propensity which he shows in the pleasure he takes to torment others by practical jokes, resembling those of a fiend in glee, exhibits a low and ungentlemanlike tone of thinking, only one degree higher than that of Roderick Random."

With the composition of *Count Fathom* in 1753 Smollett's invention seemed to be exhausted for the time. For the next ten years he occupied himself with miscellaneous literary work, translating *Don Quixote* (published 1755), compiling a *Compendium of Voyages and Travels* (1757), and producing a *History of England from the Landing of Cæsar to the Treaty of Aix-la-*

Chapelle (1757), followed by a continuation down to the date of publication (1761–65). He had very little more success in his attempts to write for the stage. The *Regicide* was never acted, and when it was published in 1749 to expose the folly of managers in not accepting it, the verdict of the public was rather with the managers than with the author. Smollett's single success on the stage was a farce with a political object, *The Reprisals, or the Tars of Old England*, produced in 1757 to excite a feeling against the French. As a journalist also Smollett was not particularly successful, partly perhaps because he attached himself to the losing side, —the Tory and High Church party. He edited their organ, *The Critical Review*, for some years, and in 1759 suffered imprisonment for an attack on Admiral Knowles. At the beginning of the reign of George III. he supported Lord Bute's ministry in *The Briton*, but *The Briton* was driven out of the field by Wilkes' *North Briton*. Altogether Smollett's revenue from play-writing and journalism seems to have been small, unless his party services were requited independently of the sale of his papers. But his name stood high with booksellers. He introduces himself in *Humphrey Clinker* as a dispenser of literary patronage, surrounded by a number of humble dependents. These were probably the hacks to whom he gave employment in his journals and in such booksellers' jobs as his translation of Voltaire and the compilation entitled *The Present State of all Nations, containing a Geographical, Natural, Commercial, and Political History of all the Countries of the Known World* (1763).

In the course of this hard miscellaneous task-work, under which Smollett's health gave way completely, he wrote by installments for the *British Magazine* (in 1760 and 1761) the curious satirical romance of *Sir Lancelot Greaves*. It is only in externals that this work bears any resemblance to *Don Quixote*.

Upon the failure of his health in 1763 Smollett went abroad and lived in France and Italy for three years. He published two volumes of *Travels* soon after his return in 1766. Three years more he spent in England, trying in vain to get some consular post abroad, where the climate might suit his shattered constitution. His extremely clever and extremely coarse political satire, *The Adventures of an Atom*, published in 1769, was probably inspired partly by resentment at the neglect of his own claims by successive ministries. He left England soon after its publication, and spent the last two years of his life in a house at Monte Novo in the neighborhood of Leghorn. Here, laboring under a painful and wasting disease, he composed his last work, *The Expedition of Humphrey Clinker*, published in 1771. This is generally regarded as his best novel. His influence upon novel-writing was wider even than Fielding's. He died at Monte Novo on October 21, 1771.

SMUGGLING denotes a breach of the revenue laws either by the importation or the exportation of prohibited goods or by the evasion of customs duties on goods liable to duty. Legislation on the subject in England has been very active from the fourteenth century downward. In the reign of Edward III. the illicit introduction of base coin from abroad led to the provision of the Statute of Treasons (25 Edw. III. st. 5) making it treason to import counterfeit money as the money called "Lushburgh." Such importation is still an offense, though no longer treason. After the Statute of Treasons a vast number of Acts dealing with smuggling were passed, most of which will be found recited in the repealing Act of 6 Geo. IV. c. 105. In the eighteenth and the early years of the nineteenth century smuggling (chiefly of wine, spirits, tobacco, and bullion) was so generally practiced in Great Britain as to become a kind of national failing, and the smuggler was often regarded as a popular hero, like the *contrabandista* of modern Spain. The gradual reduction of duties has brought the offense in the United Kingdom into comparative insignificance, and it is now almost confined to tobacco. Most of the existing legislation on the subject of smuggling is contained in the Customs Consolidation Act, 1876 (39 and 40 Vict. c. 36, ss. 169, 217).

The penalties for smuggling in the United States will be found mainly in tit. xxxiv. ch. 10 of the Revised Statutes. The seaman guilty of smuggling is liable to the same penalty as in England, and in addition to imprisonment for twelve months, s. 4,596.

SMYRNA, in ancient times one of the most important and now by far the greatest of the cities of Asia Minor has preserved an unbroken continuity of record and identity of name from the first dawn of history to the present time. It is said to have been a Lelegian city before the Greek colonists settled in Asia Minor. The name, which is said to be derived from an Amazon called Smyrna, is indubitably Anatolian, having been applied also to a quarter of Ephesus, and (under the cognate form Myrina) to a city of Æolis, and to a tumulus in the Troad. The favorable situation of Smyrna on the path of commerce between Lydia and the west raised it during the seventh century to the height of power and splendor. It lay at the eastern end of an arm of the sea, which reached far inland and admitted the Greek trading ships into the heart of Lydia. Miletus, and at a later time Ephesus, situated at the sea end of the other great trade route across Anatolia, competed for a time successfully with Smyrna for the conveyance of traffic from the interior; but both Ephesus and Miletus have long ago lost their harbors, and Smyrna now remains without a rival. The later city was founded on the site which it still occupies, partly on the slopes of a rounded hill called Pagus near the southeast end of the gulf, partly on the low ground between the hill and the sea. The beauty of the city when seen from the sea, clustering on the low ground and rising tier over tier on the hillside, is frequently praised by the ancients and is celebrated on its coins; the same impression still strikes the spectator, and must in ancient times have been much stronger, when magnificent buildings, an imposing acropolis, and the wide circle of massive walls combined with the natural scenery in one splendid picture.

The streets were broad, well paved, and regularly laid out at right angles; many were named after temples; the main street, called the Golden, ran across the city from west to east, beginning probably from the temple on Deirmen Tepe, and continuing toward Tepejik outside the city on the east, where probably the temple of Cybele, the Metroon, stood. Cybele, worshiped under the name of Meter Sipylene, from Mount Sipylus, which bounds the Smyrna valley on the north, was the tutelar goddess of the city. The plain toward the sea was too low to be properly drained, and hence in rainy weather the streets were deep with mud and water. The river Meles, which flowed by Smyrna, is famous in literature and was worshiped in the valley. The steady equable flow of the Meles, alike in summer and winter, neither swollen after rain nor dry during drought, its pleasant water, its short course, beginning and ending near the city, are celebrated by Aristides and Himerius.

In the Roman period Smyrna was the seat of a *conventus* which included southern Æolis and great part of the Hermus valley. It vied with Ephesus and Pergamum for the title "First (city) of Asia." A Christian church existed here from a very early time, having its origin in the considerable Jewish colony. POLYCARP (*q.v.*) was bishop of Smyrna.

When Constantinople became the seat of government the trade between Anatolia and the west lost in importance, and Smyrna declined apace. A Turkish freebooter named Tsacha seized Smyrna in 1084 and maintained himself there for some time, but it was recovered by the generals of Alexius Commenus. The city was several times afterward ravaged by the Turks, and had become quite ruinous when the emperor John Ducas Vatatzes about 1222 rebuilt it. The famous chieftain Aidin conquered it about 1330 and made his son Amur governor. Soon afterward the knights of Saint John established themselves in the town, but failed to conquer the citadel. In 1402 Timur stormed the town and massacred almost all the inhabitants. The Mongol conquest was only temporary, but Smyrna has remained till the present day in Mohammedan hands. It is now the greatest commercial city in the Levant; its population is about 200,000, of whom nearly half are Greeks. It is the terminus of the railway system which is gradually spreading over Anatolia. Two lines start from Smyrna; one ascends the Hermus valley by Magnesia and Sardis to Alashehr (Philadelphia), about 110 miles; the other goes south by Ephesus to the Mæander valley beside Magnesia on the Mæander and then ascends the valley to the neighborhood of Laodicea on the Lycus, 143 miles. Since the revival of the Levant trade by the Genoese and Venetians Smyrna has been the emporium for the whole produce of Anatolia; the chief raw products exported are valonea, figs, raisins, opium, madder, licorice, cotton, sponges, emery, etc. Almost the only articles of native manufacture which are exported from Smyrna are the carpets woven at Geurdiz, Coula, Ushak, and other places in the interior. Smyrna has frequently been partially destroyed by earthquakes; that of 178 A.D. is the most famous, and in 1688, 1768, and 1880 the town suffered severely.

SNAIL. In England the word "snail" in popular language is associated with Gasteropods which inhabit land or fresh water and which possess large conspicuous spiral shells; terrestrial Gasteropods in which the shell is rudimentary and concealed are distinguished as "slugs." The commonest land-snails are those species which constitute the family *Helicidæ*, order *Pulmonata*, sub-order *Stylommatophora*. The other two families of the same sub-order, *Limacidæ* and *Onchidiidæ*, include all the slugs. In the first of these are comprised all the slugs known in Great Britain, and indeed in Europe. The *Onchidiidæ* are entitled to the name "sea-slugs," as they are shell-less Pulmonates living on the seashore, though not actually in the sea. The term "water-snails" includes the whole of the remaining sub-order of the *Pulmonata*, namely, the *Basommatophora*, in which the eyes are sessile. This division comprises two families, *Limnæidæ* and *Auriculidæ;* some of the members of the first are amphibious, some entirely aquatic; the snails of the second family are found near but not in the water. The land-snails which have no gill-plume in the mantle-chamber and breathe air, but have the sexes separated, and possess an operculum, belong to the order *Azygobranchia*, of which they form a distinct sub-order, the *Pneumonochlamyda*, containing three families, *Cyclostomidæ*, *Helicinidæ*, and *Aciculidæ*. The fresh-water snails which are not Pulmonates are the *Paludinidæ*, *Valvatidæ*, and *Ampullaridæ*, together with *Neritina*, a genus of the *Neritidæ*. These all possess a fully developed gill-plume and are typical Azygobranchiates of the sub-order *Holochlamyda*, most of the members of which are marine.

The family *Helicidæ* has a world-wide distribution. In *Helix* the spire forms a more or less obtuse-angled cone; there are above 1,200 species, of which 24 are British. *Helix nemoralis*, L., of which *H. hortensis* is a variety, is one of the commonest forms. *Helix pomatia*, L., is the largest species, and is known as the "edible snail;" it is commonly eaten in France and Italy, together with other species. In *Succinea* the cone of the spire is acute-angled; three species are British. In *Vitrina* the spire is very flat and the surface glassy. In *Bulimus* the spire is elongated with a pointed apex. *Pupa* is named from its resemblance to a chrysalis, the apex being rounded. The shell of *Clausilia* is sinistral and its aperture is provided with a hinged plate. The commoner European slugs of small size all belong to the genus *Limax*, in which the opening of the mantle-chamber is posterior. *L. flavus* is the cellar slug. *L. agrestis*, *L. arborum*, *L. maximus* occur in gardens and fields. The larger black slugs are species of *Arion*, of which two are British, *A. ater* and *A. hortensis*. *Testacella haliotidea* is common in Great Britain and throughout Europe.

The *Limnæidæ* occur in all parts of the world. *Limnæus* contains the largest species. *L. peregar*, Müller; is ubiquitous in Great Britain and common all over Europe. All the species are usually infested with *Cercariæ* and *Rediæ*, the larval forms of Trematode parasites of vertebrates. *L. truncatulus* harbors the *Cercaria* of *Fasciola hepatica*, the liver-fluke, which causes rot in sheep. *Ancylus*, which occurs in rivers, has a minute limpet-like shell. *Planorbis* has the spire of the shell in one plane. *Physa* is smaller than *Limnæus* and has the upper part of the spire much shorter. In the *Auriculidæ* the aperture is denticulated. *Auricula* is confined to the East Indies and Peru. *Carychium minimum* is British.

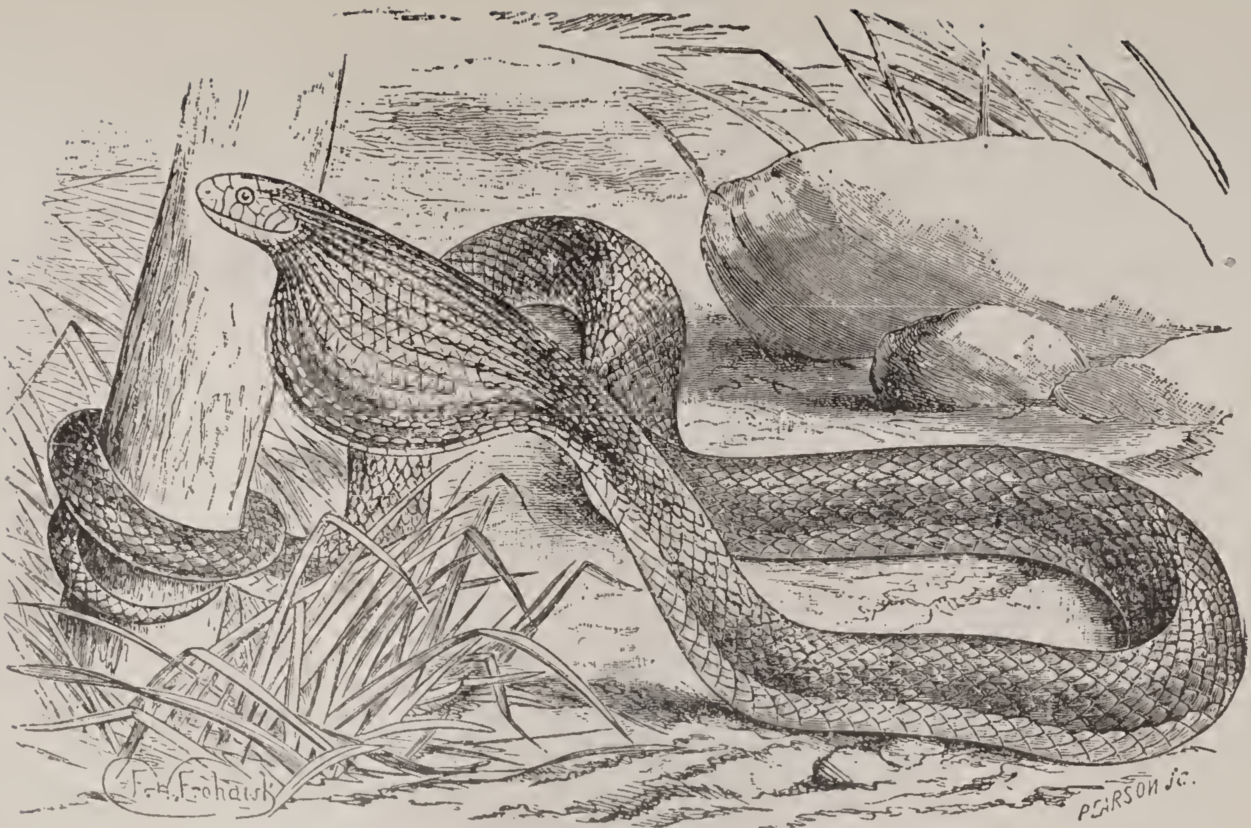
Of the *Cyclostomidæ* only one species, *Cyclostoma elegans*, Müller, is British; it hides under stones and roots. The *Helicinidæ* are exotic, ranging from the West Indies to the Philippines. Of the *Aciculidæ*, which are all minute, *Acicula lineata* is British.

The *Ampullaridæ* are confined to the tropics. *Ampullaria* has very long tentacles and a long siphon formed by the mantle. *Valvata* is common in fresh waters throughout Britain; the gill when the animal is expanded is protruded beyond the mantle-chamber. The *Paludinidæ* are common in the northern hemisphere. *Paludina* and *Bithynia* are both British genera. In *Paludina* the whorls of the spiral are very prominent; the genus is viviparous. *Bithynia* is smaller and the shell smoother.

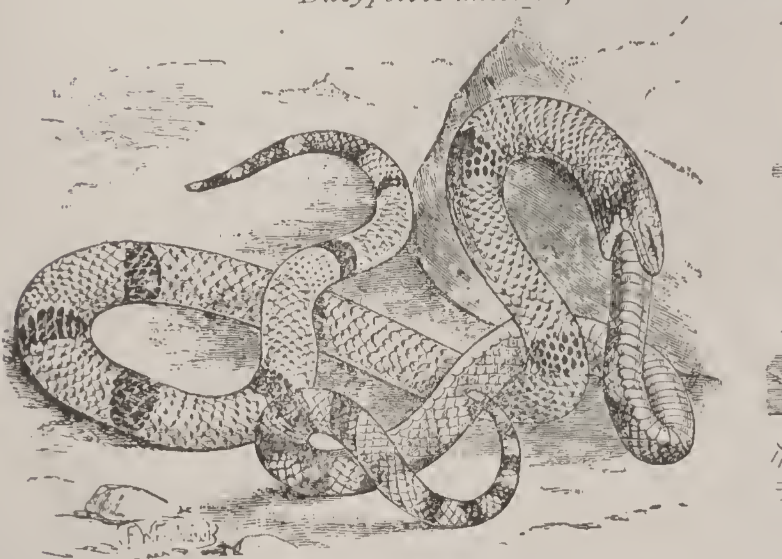
Neritina has a very small spire, the terminal portion of the shell containing nearly the whole animal.

SNAKE-BIRD, to use the name commonly given to it by the English in North America, because of its "long slender head and neck," which, its body being submerged as it swims, "appear like a snake rising erect out of the water." They bear a general resemblance both outwardly and in habits to Cormorants, but are much more slender in form and have both neck and tail much elongated. The bill also, instead of being tipped with a maxillary hook, has its edges beset with serratures directed backward, and is sharply pointed—in this respect, as well as in the attenuated neck, likening the Snake-birds to the Herons; but the latter do not generally transfix their prey as do the former.

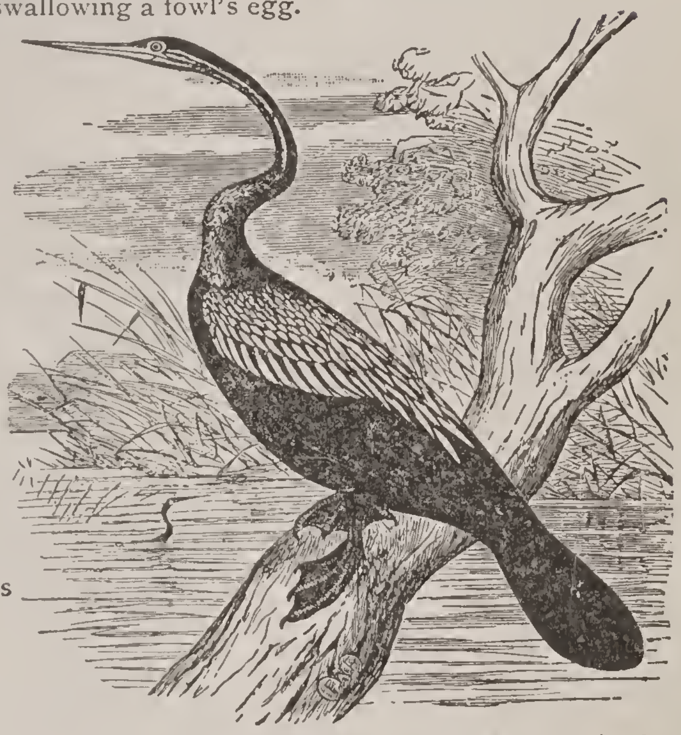
The male of the American species, which ranges from Illinois to the south of Brazil, is in full breeding-plumage a very beautiful bird, with crimson irides, the bare skin round the eyes apple-green and that of the chin orange, the head, neck, and most part of the body clothed in black glossed with green; but down each side of the neck runs a row of long hair-like white feathers, tinged with pale lilac. The much elongated scapulars and the small upper wing-coverts bear each a



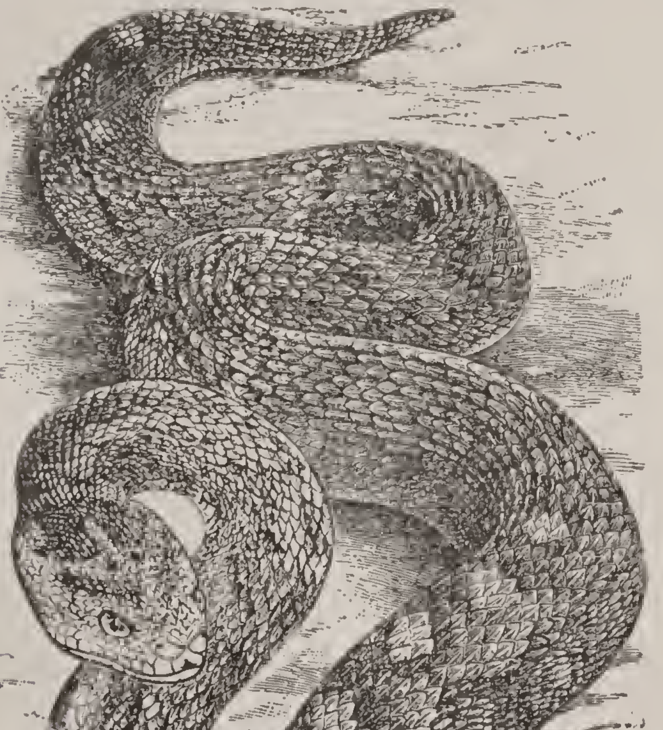
Dasypeltis unicolor, in the act of swallowing a fowl's egg.



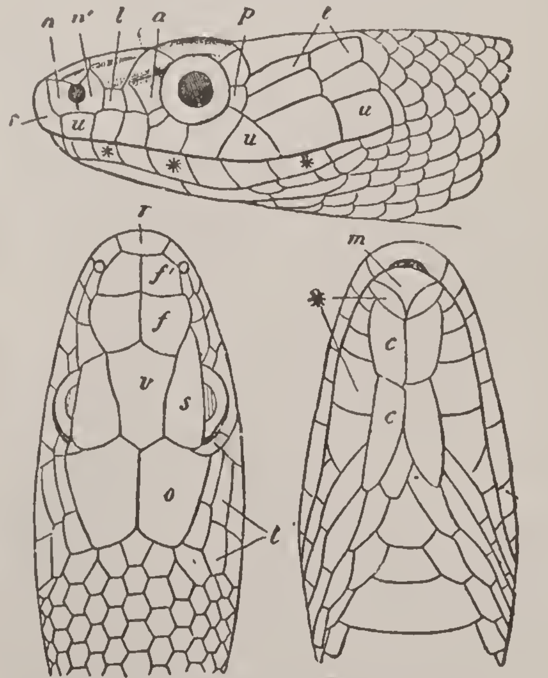
A poisonous snake (*Elaps Fulcius*) swallowing a non-poisonous (*Homalocranium semicinctum*).



Indian snake-bird (from Col. Tickell's drawing in the library of the Zoological Society).

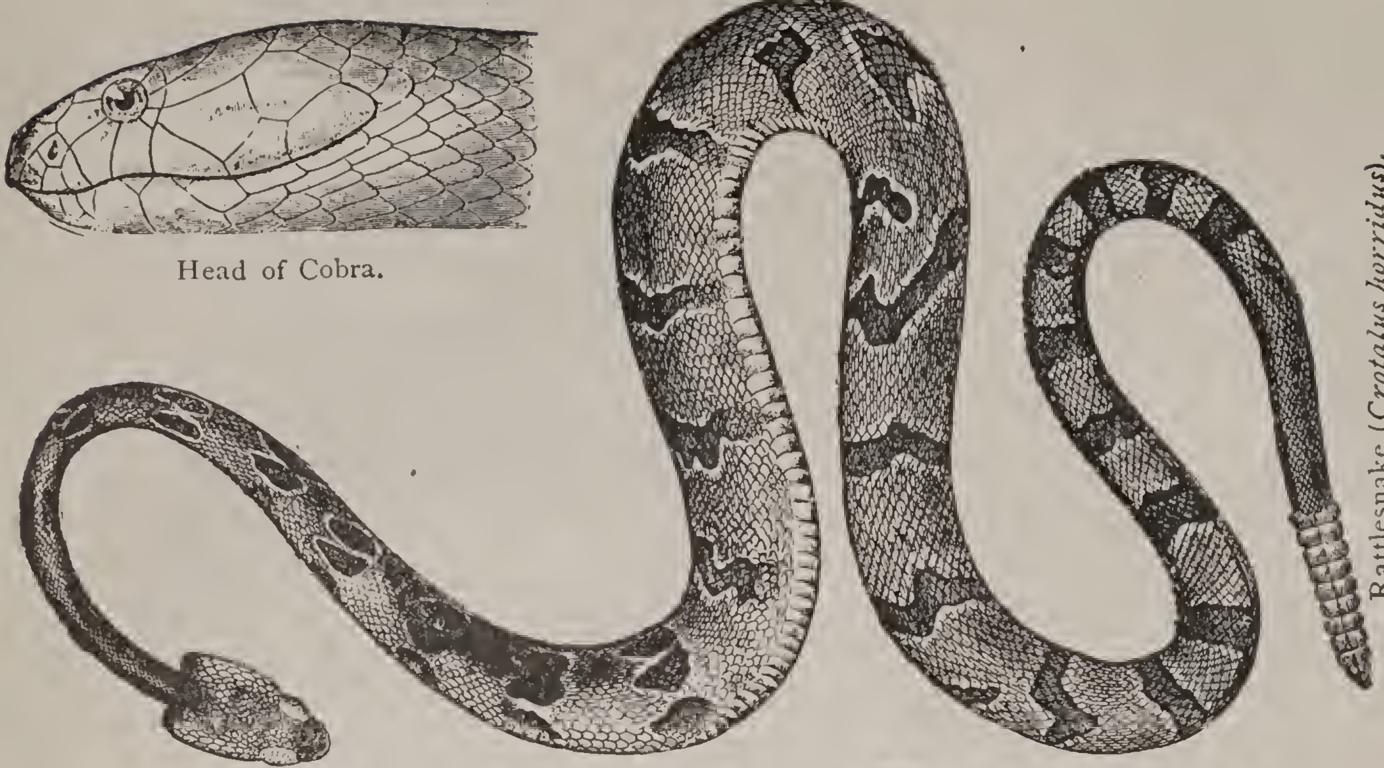


Echis carinata (India)

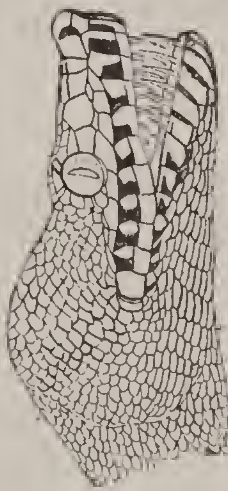


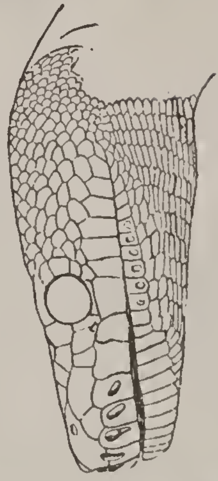
Head-shields of a snake (*Ptyas korros*). *r*, Rostral; *f*, posterior-frontal; *f'*, anterior frontal; *v*, vertical; *s*, supraciliary or supraocular; *o*, occipital; *n*, *n'*, nasals; *l*, loreal; *a*, anterior ocular or orbital, or præorbital or anteocular; *p*, postoculars; *u*, *u*, upper-labials; *t*, *t*, temporals; *m*, mental; **, lower labials; *c*, *c*, chin-shields.

SNAKES


Head of Cobra.

Rattlesnake (*Crotalus horridus*).


Head of Boa canina.


Head of Python reticulatus.

Indian whip-snake. *Passerita mycterizans*

Trimeresurus erythrurus (India).

median white mark, which on the former is a stripe pointed at either end, and on the latter a broad ovate patch. The larger wing-coverts are dull white, but the quill-feathers of the wings and tail are black, the last broadly tipped with brownish-red, passing into grayish-white, and forming a conspicuous band when the tail is spread in form of a fan, as it often is under water. The hen differs much in appearance from the cock, having the head, neck, and breast of a more or less deep buff, bounded beneath by a narrow chestnut band; but otherwise her plumage is like that of her mate, only not so bright in color.

The Snake-bird frequents the larger rivers or back-waters connected with them, where it may be seen resting motionless on some neighboring tree, generally choosing a dead branch, or on a "snag" projecting from the bottom, whence it plunges beneath the surface, in pursuit of its fishy prey, to emerge in the manner before related, showing little more than its slender head and neck. Its speed and skill under water are almost beyond exaggeration, and it exhibits these qualities even in captivity, taking—apparently without effort—fish after fish that may be introduced into its tank, however rapidly they may swim and twist, and only returning to its perch when its voracious appetite is for the moment appeased or its supply of food temporarily exhausted. The nest is variously placed, but almost always in trees or bushes overhanging the water's edge, and is a large structure of sticks, roots, and moss, in which are laid four eggs with the white chalky shell that is so characteristic of most Steganopodous birds. Not infrequently several or even many nests are built close together, and the locality that suits the Snake-bird suits also many of the Herons, so that these, its distant relatives, are often also its near neighbors. The African Snake-bird, *P. congensis* (or *levaillanti* of some authors), inhabits the greater part of that continent from Natal northward; but, though met with on the White Nile, it is not known to have occurred in Egypt. The male bird is easily distinguishable from the American species by its rufous coronal patch, its buff throat and its chestnut greater wing-coverts. A third species, *P. melanogaster*, ranges from Madagascar to India, Ceylon, Borneo, Java, and China. This so closely resembles the last-mentioned that the differences between them cannot be briefly expressed. The Australian region also has its Snake-bird, which is by some regarded as forming a fourth species, *P. novæ-hollandiæ;* but others unite it to that last-mentioned, which is perhaps somewhat variable, and it would seem (*P. Z. S.*, 1877, p. 349) that examples from New Guinea differ somewhat from those inhabiting Australia itself.

The anatomy of the genus *Plotus* has been dealt with more fully than that of most forms. Beside the excellent description of the American bird's alimentary canal furnished to Audubon by Macgillivray, other important points in its structure have been well set forth by Garrod and Forbes, showing among other things that there is an appreciable anatomical difference between the species of the New World and of the Old. In all the species the neck affords a feature which seems to be unique. The first seven of the cervical vertebræ form a continuous curve with its concavity forward, but the eighth articulates with the seventh nearly at a right angle, and, when the bird is at rest, lies horizontally. The ninth is directed downward almost as abruptly, and those which succeed present a gentle forward convexity. The muscles moving this curious framework are as curiously specialized, and the result of the whole piece of mechanism is to enable the bird to spear with facility its fishy prey.

SNAKE-ROOT. Botanically speaking, the name properly belongs to *Ophiorrhiza Mungos*, L., a plant of the Cinchona family, used in the East Indies for the purpose above indicated. In medicine, however, the roots of *Aristolochia Serpentaria*, L., *Polygala Senega*, L., or *Cimicifuga racemosa*, Elliott, are alike understood by this name, being distinguished respectively as the Virginian, Seneca, and Black Snake-roots. The first is now employed as an aromatic antiseptic tonic in typhoid fever, the second as a stimulant expectorant in bronchitis, and the third as a sedative in rheumatic or inflammatory affections, especially in muscular rheumatism and lumbago. The root of *Aristolochia reticulata*, Nutt., which is known in the United States as Red River or Texan Snake-root, is the kind most frequently met with in the United Kingdom as Serpentary or Virginian Snake-root. (See GUACO.)

The roots or rhizome of *Liatris spicata*, Willd., *Eryngium aquaticum*, L., and *Eupatorium altissimum*, L., have all been used in North America for snake-bites, the first two being known as Button Snake-root and the last as White Snake-root. The rhizome of *Asarum canadense*, L., passes under the name of Canadian Snake-root. All of these contain acrid or aromatic principles which, when a warm decoction of the drug is taken, exercise a powerfully diaphoretic, or, in some cases, diuretic action, to which any benefit that may be derived from their use must be attributed.

SNAKES (See SERPENTS) constitute an order (*Ophidia*) in the class of Reptiles which is characterized by an exceedingly elongate body, cylindrical or sub-cylindrical, and terminating in a tapering tail. The integuments are folded into flat imbricate scales, which are rarely tubercular or granular. The spinal column consists of a very great number of vertebræ, with which the numerous ribs are movably articulated. Limbs are entirely absent, or only rudiments of the posterior occur more or less hidden below the skin; there is no sternum. The bones of the palate and jaws are movable: the mandibles are united in front by an elastic ligament and are very distensible. Generally both jaws and the palate are toothed, the teeth being thin and needle-like. There are no eye-lids, no ear-opening. The vent is a transverse slit. Great as is the difference in appearance between a typical snake and a typical lizard, the two orders of Ophidians and Lacertilians are nearly allied; the former is probably merely a specialized descendant of the latter or of the pythonomorphous reptiles, or perhaps of both.

The number of known species of snakes has been given as 1,500 by some authorities and as 1,800 by others. The limits of their distribution seem to be the 70th parallel N. latitude in Europe, the 54th in British Columbia, and the 40th parallel S. latitude in the southern hemisphere. The number of species and of individuals in a species is small in the temperate zones, but increases as the tropics are approached. In the tropical zone they are abundant, especially where a well watered soil nourishes a rich vegetation, with glades open to the sun, and where a variety of small animals serve as an abundant and easily obtained prey. It is in the tropics also that the largest (boas, pythons) and the most specialized kinds occur (tree snakes, sea snakes, the large poisonous snakes). On the other hand, every variety of soil is tenanted by some kind of snakes: they form a contingent in every desert fauna. In accordance with this general distribution snakes show a great amount of differentiation with regard to their mode of life and general organization; and from the appearance alone of a snake a safe conclusion can be drawn as to its habits. The following categories may be distinguished:

(1) Burrowing snakes which live under ground and but rarely appear on the surface. They feed chiefly on

invertebrate animals, and none are poisonous. **(2)** Ground snakes, living chiefly on the ground, and rarely ascending bushes or entering water. They feed chiefly on terrestrial vertebrates. The majority are non-poisonous. (3) Tree snakes, which are able to climb bushes or trees with facility or pass even the greater part of their existence on trees. They feed on animals which likewise lead an arboreal life, rarely on eggs. Poisonous as well as innocuous snakes are represented in this category. (4) Freshwater snakes, living in or frequenting fresh waters; they are excellent swimmers and divers. They feed on fish, frogs, and other aquatic animals, and are innocuous and viviparous. (5) Sea snakes are distinguished by the compressed, rudder-shaped tail, supported by erect neural and hæmal spines. They never leave the sea (with the exception of one genus) and are unable to move on land. They feed on fishes, are viviparous and poisonous.

Snakes are the most stationary of all vertebrates; as long as a locality affords them a sufficiency of food and some shelter to which they can readily retreat, they have no inducement to change it. Their dispersal, therefore, must have been extremely slow and gradual. Although able to move with extreme rapidity, they cannot maintain it for any length of time. Their organs of locomotion are the ribs, the number of which is very great, nearly corresponding to that of the vertebræ of the trunk. They can adapt their motions to every variation of the ground over which they move, yet all varieties of snake locomotion are founded on the following simple process. When a part of the body has found some projection of the ground which affords it a point of support, the ribs are drawn more closely together, on alternate sides, thereby producing alternate bends of the body. The hinder portion of the body being drawn after, some part of it finds another support on the rough ground or a projection; and, the anterior bends being stretched in a straight line, the front part of the body is propelled in consequence. During this peculiar locomotion the numerous broad shields of the belly are of great advantage, as by means of their free edges the snake is enabled to catch and use as points of support the slightest projections of the ground. A pair of ribs corresponds to each of these ventral shields. Snakes are not able to move over a perfectly smooth surface. Thus it is evident that they move by dragging their body over the ground, or over some other firm base, such as the branch of a tree; hence the conventional representation of the progress of a snake, in which its undulating body is figured as resting by a series of lower bends on the ground while the alternate bends are raised above it, is an impossible attitude. Also the notion that snakes when attacking are able to jump off the ground is quite erroneous; when they strike an object, they dart the fore part of their body, which was retracted in several bends, forward in a staight line.

With very few exceptions, the integuments form imbricate scale-like folds arranged with the greatest regularity; they are small and pluriserial on the upper parts of the body and tail; large and uniserial on the abdomen, and generly biserial on the lower side of the tail. The folds can be stretched out, so that the skin is capable of a great degree of distension. The scales are sometimes rounded behind, but generally rhombic in shape and more or less elongate; they may be quite smooth or provided with a longitudinal ridge or *keel* in the middle line. The integuments of the head are divided into non-imbricate shields or plates, symmetrically arranged, but not corresponding in size or shape with the underlying cranial bones or having any relation to them. The skin does not form eyelids; but the epidermis passes over the eye forming a transparent disk, concave like the glass of a watch, behind which the eye moves. It is the first part which is cast off when the snake sheds its skin; this is done several times in the year, and the epidermis comes off in a single piece.

The tongue in snakes is narrow, almost worm-like, generally of a black color and forked; that is, it terminates in front in two extremely fine filaments. It is often exserted with a rapid motion, sometimes with the object of feeling some object, sometimes under the influence of anger or fear.

Snakes possess teeth in the maxillaries, mandibles, palatine, and pterygoid bones, sometimes also in the intermaxillary; they may be absent in one or the other of the bones mentioned. In the innocuous snakes the teeth are simple and uniform in structure, thin, sharp like needles, and bent backward; their function consists merely in seizing and holding the prey. In the true poisonous snakes the maxillary dentition has undergone a special modification. The so-called Colubrine Venomous snakes, which retain in a great measure an external resemblance to the innocuous snakes, have the maxillary bone not at all, or but little, shortened, armed in front with a fixed, erect fang, and provided with a deep groove or closed canal for the conveyance of the poison, the fluid being secreted by a special poison-gland. In the other venomous snakes (Viperines and Crotalines) the maxillary bone is very short, and is armed with a single very long curved fang with a canal and aperture at each end.

All snakes are carnivorous, and as a rule take living prey only; a few feed habitually or occasionally on eggs. Many swallow their victim alive; others first kill it by smothering it between the coils of their body (constriction). The effects of a bite by a poisonous snake upon a small mammal or bird are almost instantaneous, preventing its escape; and the snake swallows its victim at its leisure, sometimes hours after it has been killed. The prey is always swallowed entire, and, as its girth generally much exceeds that of the snake, the progress of deglutition is very laborious and slow. Digestion is quick and much accelerated by the quanity of saliva which is secreted during the progress of deglutition, and in venomous snakes probably also by the chemical action of the poison. Only very few poisonous snakes (like *Ophiophagus elaps*) are known to resent the approach of man so much as to follow him on his retreat and to attack him. Others, as if conscious of their fearful power of inflicting injury, are much less inclined to avoid collision with man than innocuous kinds, and are excited by the slightest provocation to use that power in self-defense. The physiological effects of all these poisons on warm-blooded vertebrates are identical, and vary only in degree, the smallest quantities of the poison producing a local irritation, while in serious cases the whole mass of the blood is poisoned in the course of some seconds or minutes, producing paralysis of the nerve-centers.

The degree of danger arising from a snake-bite to man depends in the first place on the quantity of poison injected. In the second place it depends on the strength of the individual bitten. Thirdly, it depends on the position and depth of the bite: the bite may be merely a superficial scratch, or may penetrate into tissue having few blood-vessels, and thus be almost harmless; or it may be deep in vascular tissue or even penetrate a vein, producing immediate and fatal effects. The local appearances in the neighborhood of a poisoned wound, which soon after the bite is much swollen and discolored and very painful, readily prove its character; but this can often be ascertained also immediately after the bite by the inspection of the wound—the teeth, which are so differently arranged in poisonous and non-poisonous snakes, leaving a different pattern on the skin.

Unfortunately no antidote is known capable of counteracting or neutralizing the action of snake-poison. Some years ago injections of ammonia or liquor potassæ were recommended, but there is the obvious objection that hardly in one out of a thousand cases of snake-bite would either the appliances or the operator be at hand. Fayrer's experiments, however, have distinctly disproved the efficacy of this remedial measure. Equally useless is permanganate of potassium; it is indeed true that a solution of this compound destroys the properties of snake-poison when mixed with it; and therefore such of the poison as remains in the wound will be neutralized by the external application or injection of the permanganate, but the remedy is entirely without effect after the poison has passed into the circulation. Treatment is therefore limited to endeavors to prevent by mechanical means the poison from entering the circulation, or by chemical agencies to destroy or remove as much of it as possible that remains in the wound, and to save the patient from the subsequent mental and physical depression by the free use of stimulants.

To the mode of treatment summarized by Günther but little can be added. (1) If the wound is on some part of the extremities, one or more ligatures should be made as tightly as possible at a short distance above the wound, to stop circulation; this is most effectually done by inserting a stick under the ligature and twisting it to the uttermost. The ligatures are left until means are taken to destroy the virus in the wound and other remedial measures are resorted to, or until the swelling necessitates their removal. (2) The punctured wounds should be enlarged by deep incisions, to cause a free efflux of the poisoned blood, or should be cut out entirely. (3) The wound should be sucked either by the patient or by some other person whose mouth is free from any solution of continuity. Cupping-glasses, where they can be applied, answer the same purpose, but not with the same effect. (4) By cauterization with a red-hot iron, a live coal, nitrate of silver or carbolic or mineral acid, or by injections of permanganate of potassium, the poison which remains in the wound can be destroyed or neutralized. Ammonia applied to the wound as a wash and rubbed into the neighboring parts is likewise undeniably of great benefit, especially in less serious cases, since it alleviates the pain and reduces the swelling. (5) Internally, stimulants are to be taken freely; they do not act as specifics against the virus, but are given to excite the action of the heart, the contractions of which become feeble and irregular, to counteract the physical and mental depression, and to prevent a complete collapse. Brandy, whisky, and ammonia in any of its officinal forms should be taken in large doses and at short intervals. The so-called "snake-stones" can have no other effect than, at the best, to act as local absorbents, and can be of use only in the very slightest cases.

Snakes are oviparous; they deposit from ten to eighty eggs of an ellipsoid shape, covered with a soft leathery shell, in places where they are exposed to and hatched by moist heat. The parents pay no further attention to them, except the pythons, which incubate their eggs by coiling their body over them, and fiercely defend them. In some families, as many freshwater snakes, the sea snakes, *Viperidæ* and *Crotalidæ*, the eggs are retained in the oviduct until the embryo is fully developed. These snakes bring forth living young, and are called "ovo-viviparous."

We have now to add some notes on snakes to which special interest is attached, or which are most frequently brought to the notice of the observer or reader. The snakes most remote from the true Ophidian type are the members of the first family, *Typhlopidæ*. They are a small degraded form, adapted for burrowing and leading a subterranean life like worms.

An almost unbroken series leads from these degraded worm-like snakes to the typical *Colubridæ*, of which the Smooth Snake of Europe (*Coronella*), the Corn Snake of North America (*Coluber*), the Rat Snake of India and South America (*Ptyas Spilotes*), Æsculapius Snake of the south of Europe, the common Ring Snake of England (*Tropidonotus*), are well-known representatives. The Smooth Snake (*Coronella lævis*) is common in the warmer parts of Europe, extending northward into the New Forest district of England. In coloration, general habits, and size it somewhat resembles the viper; but, although it is rather fierce and ready to bite when caught, it is quite harmless and soon becomes tame in captivity.

The Indian Rat Snakes (*Ptyas mucosus* and *P. korros*) are two of the most common species of India, the former inhabiting India proper and Ceylon, the latter the East Indian Archipelago, Siam, and southern China. *P. mucosus* is a powerful snake, attaining to a length of seven feet, the tail being one-third or rather more; it is easily recognized by having three loreal shields, one above the other two; its scales are arranged in seventeen rows.

Æsculapius' Snake (*Coluber æsculapii*) was probably the species held in veneration by the ancient Romans. It grows to a length of about five feet, is of mild disposition, and can be readily domesticated. Its original home is Italy, where it is common, but it has extended its range northward across the Alps into the south of France, and thence into northern Spain. Following the course of the Inn and the Danube, it has reached the Black Sea; and it is also now common in several localities along the middle parts of the Rhine.

The common British Snake or Ring Snake (*Tropidonotus natrix*) is extremely common all over Europe (except in the northern parts), and belongs to a genus extremely rich in species, which are spread over Europe, Asia, India, Australia, and North America. Some of the species like the Indian *T. quincunincatus* and *T. Stolatus* and the North American *T. ordinatus*, are perhaps more abundant as regards the number of individuals than any other snake. *T. natrix* is easily recognized even at a distance by two yellow or white spots which it has behind its head. It grows rarely to a length of four feet; it never bites, and feeds chiefly on frogs and toads.

A very peculiar genus of snakes, *Dasypeltis*, represented by three species only, is the type of a separate family and is restricted in its distribution to Central and South Africa. In Cape Colony these snakes are well known under the name of "eyervreter" *i.e.*, "egg-eaters." Their principal diet seems to consist of eggs, their mouth and œsophagus being so distensible that an individual scarcely twenty inches in length, and with a body not surpassing a man's little finger in circumference, is able to swallow a hen's egg. The teeth in the jaws are very small and few in number; but the inferior processes of the posterior cervical vertebræ are prolonged and provided with a cap of enamel, and penetrate the œsophagus, forming a kind of saw. As the egg passes through the œsophagus its shell is broken by this apparatus, and while its contents are thus retained and swallowed without loss, the hard fragments of the shell are rejected.

The Tree Snakes (*Dendrophidæ*) are among the greatest ornaments of tropical fauna. The majority lead an exclusively arboreal life; only a few descend to the ground in search of their food. They prey upon every kind of arboreal animal—birds, tree-frogs, tree-lizards, etc. All seem to be diurnal, and the larger kinds attain to a length of about four feet. The most beautiful of all snakes are perhaps certain varieties of *Chrysopelea ornata*, a species extremely common in the Indian Archipelago and many parts of the continent of tropical Asia.

The features by which the tree-snakes are distinguished are still more developed in the family of Whip Snakes (*Dryophidæ*), whose excessively slender body has been compared to the cord of a whip. Although arboreal, like the former, they are nocturnal in their habits, having a horizontal instead of a round pupil of the eye. They are said to be of a fierce disposition, feeding chiefly on birds; and indeed a long tooth placed about the middle of the maxillary seems to assist them much in penetrating the thick covering of feathers and in obtaining a firm hold on their victims.

The well-defined family of *Lycodontidæ* is chiefly composed of ground snakes, but a few of its members have a sufficiently elongated body to indicate arboreal habits. The Indian genera are principally reptilivorous, while the African prey upon mice, rats, and other small nocturnal mammals. Scarcely any other snake is so common in collections as the Indian *Lycodon aulicus*, which inhabits the continent of India and Ceylon, some of the islands of the East Indian Archipelago (Timor), and the Philippines.

The *Boidæ* are so similar in their habits to the Pythons (see PYTHON), that it is sufficient to refer in a few words to the species most frequently mentioned in the literature dealing with the fauna of the virgin forests of tropical America. The real *Boa constrictor* is common from the northern parts of Central America to southern Brazil, and is frequently brought alive to Europe. Generally it is only about seven feet long; but sometimes there have been seen skins of specimens which must have been nearly twice that length. The gigantic snakes of from twenty to thirty feet in length mentioned in books of South-American travels belong to a different species, the Anaconda or *B. murina*, which has the same habits as the *B. constrictor*, haunting the banks of rivers and lakes and lying in wait for peccaries, deer, and other mammals of similar size, which come to the water to drink. It has already been stated (see REPTILES) that this family is not restricted to South America, but is well represented in the tropical Pacific region. The Boid most common in that region is *Enygrus*, which ranges all over New Guinea, the Fiji Islands, the Solomon group, Samoa, and many other Pacific islands; it is of small size, scarcely thirty inches long.

We pass now to the Venomous Colubrine snakes, that is, snakes which combine with the possession of a perfect poison apparatus the scutellation and general appearance of the typical non-poisonous snakes. No snake of this sub-order is more widely known and more dreaded than the species of the genus *Naja* or cobras. Probably more than two species should be distinguished; but the two which cause the greatest loss of life are the Indian Cobra or Cobra di Capello or Naga (*N. tripudians*) and the African Cobra (*N. haje*). In a report to the Bengal Government the commissioner of Burdwan states that he has ascertained from statistics collected during a series of nine years that above 1,000 persons are killed annually by snakes in a population of nearly 6,000,000, the majority being bitten by the cobra, which is by far the most common. The cobra is found throughout India, extending westward to the Sutlej and eastward to the Chinese island of Chusan; in the Himalayan Alps it reaches an altitude of 8.000 feet; it occurs also in abundance in many of the islands of the East Indian Archipelago, and is here joined by another apparently distinct species (*N. sputatrix*), while in the central portions of Asia, which geographically separate it from the African cobra, it is replaced by a fourth, *N. oxiana*. The ground color varies from a yellowish olive to brown and to black with or without whitish or white cross-bands on the back, and with from one to four or without any black bars across the anterior part of the belly. Some of these varieties are characterized by a pair of very conspicuous white, black-edged spectacle-like marks on the expansible portion of the neck, called the "hood"; but these marks may lose their typical form and become merely a pair of ocellated spots, or be confluent into a single ocellus, or may be absent altogether. It is more of nocturnal than of diurnal habits, feeding on every kind of small Vertebrates and also eating eggs. The cobra and the other species of this genus have the anterior ribs elongated, and can move them so as to form a right angle with the spine. The effect of this movement is the dilatation of that part behind the head which is generally ornamented with the spectacles or ocelli. When the cobra is irritated or excited it spreads its "hood," raising the anterior third of the body from the ground, gliding along with the posterior two-thirds, and holding itself ready to strike forward or sideward. All accounts agree that the cobra is not aggressive unless interfered with or impelled by a sense of danger. It is said to share the habitations of man where superstition prevents people from molesting it, and to live peaceably with the inmates; and there is no doubt that professional snake-charmers exercise a certain control over them, for, although generally the cobras exhibited are rendered harmless by the removal of the poison-fangs, they very rarely attempt to injure their masters even after the fangs have been reproduced. Of the natural enemies of the cobra, the mongoos does probably the greatest amount of execution; many are destroyed by fowls shortly after being hatched. The cobra is oviparous, depositing from eighteen to twenty-five eggs in the year. The African cobra is extremely similar to its Indian congener in size, form, and habits, and varies in coloration to the same extent. It inhabits the whole of Africa, from Egypt to the Cape of Good Hope, but has been nearly exterminated in the cultivated districts of the Cape Colony. One of its greatest enemies (as indeed of all snakes) is the secretary bird of South Africa (*Serpentarius*), which, therefore, is protected by law. Accidents from this snake do not appear to be of common occurrence; they happen more frequently to domestic animals than to man.

More dangerous than either of the species of cobra, which it exceeds in size, is *Hamadryas* or *Ophiophagus elaps*, the largest poisonous snake of the Old World, attaining to a length of fourteen feet. It has almost the same geographical range as the cobra, but is much scarcer; it greatly resembles it also in general habit, but differs from it in scutellation, possessing three large shields behind the occipitals. It has the reputation of occasionally attacking and pursuing man; its favorite food consists of other snakes.

The species of *Bungarus*, four in number, are extremely common in India, Burmah, and Ceylon, and are distinguished by having only one row of undivided sub-caudal shields. Three of the species have the body ornamented with black rings, but the fourth and most common (*B. cæruleus*), the "krait" of Bengal, possesses a dull and more uniform coloration. The fangs of the bungarums are shorter than those of the cobras, and cannot penetrate so deeply into the wound. Their bite is therefore less dangerous and the effect on the general system slower, so that there is more prospect of recovery

by treatment. Several genera of this sub-order of Venomous Colubrines are similar to the innocuous *Calamariidæ* in general habit; that is, their body is of a uniform cylindrical shape, terminating in a short tail, and covered with short polished scales; their head is short, the mouth rather narrow, and the eye small. They are the tropical American *Elaps*, the Indian *Callophis*, the African *Pœcilophis*, and the Australian *Vermicella*. The majority are distinguished by the beautiful arrangement of their bright and highly ornamental colors; many species of *Elaps* have the pattern of the so-called coral snakes, their body being encircled by black, red, and yellow rings—a pattern which is peculiar to snakes, venomous as well as non-venomous, of the fauna of tropical America. Although the poison of these narrow-mouthed snakes is probably as virulent as that of the preceding, man has much less to fear from them, as they bite only under great provocation. No part of the world possesses so many snakes of this sub-order as Australia, where, in fact, they replace the non-venomous Colubrine snakes.

The small family *Causidæ* contains two African genera well known to and much feared by the inhabitants of South Africa. One, *Sepedon hæmachates*, is named by the Boers "roode koper kapel" or "Ring-Neck Snake," the latter name being, however, often applied also to the cobra. It resembles in color some varieties of the latter snake, and like this, it has the power, though in a less degree, of expanding its hood. But its scales are keeled and its form is more robust. It is equally active and courageous, not rarely attacking persons who approach too near to its resting-place. In confinement it evinces great ferocity, opening its mouth and erecting its fangs, from which the poison is seen to flow in drops. During such periods of excitement it is even able, by the pressure of the muscles on the poison-duct, to eject the fluid to some distance; hence it shares with the cobra a third Dutch name, that of "spuw slang" (Spitting Snake). It grows to a length of two or three feet. The second African snake of this family is the "schap-sticker" (Sheep Stinger), *Causus rhombeatus*. It is extremely common in South Africa and extends far northward along the eastern as well as western coast. It is of smaller size than the preceding and causes more injury to animals, such as sheep, dogs, etc., than to man. It varies in color, but a black mark on the head like an inverted V remains nearly always visible.

The *Dinophidæ* are the arboreal type of this sub-order; they resemble non-venomous tree snakes in their graceful form, narrow scales, generally green coloration, and in their habits; nevertheless the perfect development of their poison apparatus, their wide mouth, their large size (they grow to a length of seven feet), leave no doubt that they are most dangerous snakes.

Of Sea Snakes (*Hydrophidæ*) some fifty species are known. All are inhabitants of the tropical Indo-Pacific ocean, and most numerous in and about the Persian Gulf, in the East Indian Archipelago, and in the seas between southern China and northern Australia. One species which is extremely common (*Pelamis bicolor*), and which is easily recognized by the black color of its upper and the yellowish tints of its lower parts (both colors being sharply defined), has extended its range westward to the sea round Madagascar, and eastward to the Gulf of Panama. Sea Snakes are viviparous and pass their whole life in the water; they soon die when brought on shore.

Passing over Rattlesnakes and Vipers, which are treated of in separate articles, we notice the following types of the fourth sub-order, the *Ophidii viperiformes*.

The sole representative of the sub-order in Australia is the Death Adder (*Acanthophis antarctica*), a short, stout snake having a similar habitus and habits to vipers, and scarcely attaining three feet in length. It differs from the other Viperines in having the poison-fang permanently erect. Although much feared, and justly, there is reason to believe that its bite is not so dangerous as has been represented, and that the majority of the fatal accidents ascribed to it are in fact caused by other snakes, probably *Hoplocephalus curtus*. It occurs throughout the whole of Australia, except Tasmania and perhaps South Australia. Generally it is of a uniform gray color, relieved by some forty dark rings of irregular outline.

The "tic-prolonga" of the Singalese (*Daboia russellii*) is beautifully marked; on a light chocolate ground color three series of large black white-edged rings run along the back and sides of the body, a yellow line borders the surface of the head on each side, the two lines being convergent on the snout. It attains to a length of fifty inches, and occurs locally in abundance in southern India, where it is called "cobra monil;" in Bengal, where it is called "jessur;" in the plains of central India, as well as in the Himalayas to an altitude of 6,000 feet; and in Burmah. It is highly poisonous, probably causing many deaths.

The small Viperine snake, *Echis carinata*, which scarcely exceeds a length of twenty inches, shares with it the preceding part of its range, being found in the arid districts of southern India, and extending through the intervening parts of Asia to North Africa. It is a desert type, having the lateral scales curiously arranged, strongly keeled, with the tips directed downward. It produces with their aid a rustling sound. While some observers deny that fatal consequences have resulted from its bite, Dr. Imlach reports that it (the "kuppur") is "the most deadly poisonous snake in Sind." This desert type is replaced farther south in Africa, where vegetation flourishes, by a closely allied genus, *Atheris*, which, however, possesses a prehensile tail and vivid coloration, and has assumed truly arboreal habits.

Of the pit vipers without rattles the largest and most formidable inhabit tropical America. *Trigonocephalus iararaca*, *T. atrox*, and *T. lanceolatus* attain to a length of six feet, the first two being common in Brazil, and northward to Central America. The last is limited to some islands in the West Indies, especially Martinique and St. Lucia, and is generally known by the name of "fer de lance," which has been given to it from the markings on its head. It infests the sugar-plantations, and has greatly multiplied in consequence of the protection which the cover of the cane-fields afforded it, and the abundance of food supplied by the rats which swarm on the plantations. These three species of *Trigonocephalus* are surpassed in size by *Lachesis mutus*, probably the largest of terrestrial poisonous snakes, which is said to exceed a length of ten feet, and is bulky in proportion. It is confined to the hottest parts of tropical America. Similar snakes, but smaller in size, inhabit the warmer and temperate parts of North America, viz., the Copper-head (*Cenchris contortrix*) and the Crater-moccasin (*C. piscivorus*), the former of terrestrial habits, the latter being always found near water and feeding chiefly on aquatic animals. Both are much feared and cause accidents more frequently than rattlesnakes, being more aggressive and striking the intruder without previously warning him of their presence. In the Indian region this type of pit vipers without rattles is likewise well represented, one genus (*Trimeresurus*) being adapted for an arboreal life, like *Atheris* among the *Viperidæ*. Their body is not more elongate than that of other ground Crotalines, but their tail is prehensile, and their color generally resembles that of the bright foliage among which they live. Sometimes bright yellow or red markings render these snakes still more pleasing to the eye. Accidents caused by them are of not uncommon occurrence, but fortunately only a few individuals exceed a length of two feet, and the consequences of their bite are less to be dreaded than of that of other allied genera. The bite of larger specimens, of from 2 to 3 feet long, is more dangerous and has occasionally proved fatal. They feed on frogs, mammals, and birds.

SNAKE-STONE, a name sometimes applied to Water-of-Ayr stone (see Hone). Certain stones reputed, on insufficient grounds, to possess efficacy as antidotes to snake-bites are known as snake-stones. The term is also popularly applied to ammonites and certain other fossils which, owing to their spiral shape, were formerly regarded as petrified snakes.

SNEEK, a town of the Netherlands, in the province of Friesland, eighteen miles south-southwest of Leeuwarden, with which it is connected by canal and (since 1885) by rail. It is one of the great butter and cheese markets of the country and has communal buildings (1863), a town-house, a court-house, an orphanage, a synagogue, and several churches, in one of which (the Groote or Maartenskerk) is the tomb of the naval hero Lange Pier (Long Peter). The population of the town was, in 1870, 8,456; that of the commune, which numbered only 3,253 in 1714, was 9,248 in 1870, and 10,496 in 1880.

SNELL, Willebrord, commonly known as Snellius, astronomer and mathematician, was born at Leyden in 1591. In 1613 he succeeded his father as professor of mathematics in the university of Leyden. In 1615 he planned and carried into practice a new method of finding the dimensions of the earth, by determining the distance of one point on its surface from the parallel of another, by means of a triangulation. His work *Eratosthenes Batavus*, published in 1617, describes the method and gives as the result of his operations between Alkmaar and Bergen-op-Zoom a degree of the meridian equal to 55,100 toises = 117,449 yards. (A later recalculation has given 57,033 toises = 121,569 yards, after applying some corrections to the measures indicated by himself.) Snell also distinguished himself as a mathematician, and discovered the law of refraction, which, however, is generally attributed to Descartes, who made it more widely known. Snell died at Leyden on October 30, 1626.

SNIPE (Anglo-Saxon *Snite*, Icelandic *Snípa*, Dutch *Snip*, German *Schnepfe*), one of the commonest Limicoline birds, in high repute no less for the table than for the exciting sport it affords. It is the *Scolopax gallinago* of Linnæus, but by many later writers separated from that genus, the type of which is the Woodcock (*q.v.*), and hence has been variously named *Gallinago cœlestis*, *G. media*, or *G. scolopacina*. Though considerable numbers are still bred in the British Islands, notwithstanding the diminished area suitable for them, most of those that fall to the gun are undoubtedly of foreign origin, arriving from Scandinavia toward the close of summer or later, and many will outstay the winter if the weather be not too severe, while the home-bred birds emigrate in autumn to return the following spring.

The Snipe is fortunately too well known to need description, for a description of its variegated plumage, if attempted, would be long. It may be noticed, however, as subject to no inconsiderable variation, especially in the extent of dark markings on the belly, flanks, and axillaries, while examples are occasionally seen in which no trace of white, and hardly any of buff or gray, is visible—the place of these tints being taken by several shades of chocolate-brown. Again, a slight deviation from the ordinary formation of the tail, whose rectrices normally number fourteen, and present a rounded termination, has led to the belief in a species, *S. brehmi*, now wholly discredited. But, setting aside two European species, to be presently noticed more particularly, there are at least a score, more or less nearly allied, belonging to various parts of the world, for no considerable territory is without its representative. Thus North America produces *G. wilsoni*, so like the English Snipe as not to be easily distinguished except by the possession of sixteen rectrices, and Australia has *G. australis*, a larger and somewhat differently colored bird with eighteen rectrices. India, while affording a winter resort to multitudes of the common species, which, besides Europe, extends its breeding range over the whole of northern Asia, has the so-called Pin-tailed Snipe, *G. stenura*, in which the number of rectrices is still greater, varying from twenty to twenty-eight, it is said, though twenty-two seems to be the usual number.

The Double or Solitary Snipe of English sportsmen, *S. major*, a larger species, also inhabits northern Europe and may be readily recognized by the white bars in its wings and by its sixteen or occasionally eighteen rectrices. In the breeding season much of its love-performance is exhibited on the ground, and the sounds to which it gives rise are of another character; but the exact way in which its "drumming" is effected has not been ascertained. It visits Great Britain every year at the close of summer, but in very small numbers, and is almost always seen singly—not uncommonly in places where no one could expect to find a Snipe.

The third species of which any details can here be given is the Jack, or Half-Snipe, *S. gallinula*, the smallest and most beautifully colored of the group. Without being as numerous as the common or full Snipe, it is of frequent occurrence in Great Britain from September to April (and occasionally both earlier and later); but it breeds only, so far as is known, in northern Scandinavia and Russia; and the first trustworthy information on that subject was obtained by Wolley in June, 1853, when he found several of its nests near Muonioniska in Lapland.

As a group the Snipes are in several respects highly specialized, but here there is only space to mention the sensitiveness of the bill, which, though to some extent noticeable in many Sandpipers, is in Snipes carried to an extreme by a number of filaments, belonging to the fifth pair of nerves, which run almost to the tip, and open immediately under the soft cuticle in a series of cells that give this portion of the surface of the premaxillaries, when exposed, a honeycomb-like appearance. Thus the bill becomes a most delicate organ of sensation, and by its means the bird, while probing for food, is at once able to distinguish the nature of the objects it encounters, though these are wholly out of sight. So far as is known, the sternum of all the Snipes, except the Jack-Snipe, departs from the normal Limicoline formation, a fact which tends to justify the removal of that species to a separate genus, *Limnocryptes*.

SNORRO STURLUSON (Snorri, son of Sturla), the celebrated Icelandic historian, born in 1179, the youngest son of a chief in the Vestfirðir (western fiords), was brought up by a powerful chief, Jon Loptsson, in Odda, who seems first to have awakened in him an interest for history and poetry. His career begins with his marriage, which made him a wealthy man; in 1206 he settled at Reykjaholt, where he constructed magnificent buildings and a bath of hewn stones, preserved to the present day, to which water was conducted from a neighboring hot spring. The prominent features of his character seem to have been cunning, ambition, and avarice, combined with want of courage and aversion to effort. By royal invitation he went in 1218 to Norway, where he remained a long time with the young king Hakon and his tutor Earl Skuli. On his return home Snorro sent his son to the king as a hostage, and made peace between Norway and Iceland, but his power and influence were used more for his own enrichment and aggrandizement than for the advantage of the king. Hakon, therefore, stirred up strife between Snorro's kinsman Sturla and Snorro, who had to fly from Reykjaholt in 1236; and in 1237 he left the country and went back to Norway. Here he joined the party of Skuli, who was meditating a revolt. Meanwhile Hakon, who had vanquished Skuli in 1240, sent orders to Gissur to punish Snorro for his disobedience either by capturing him and sending him back to Norway or by putting him to death. Gissur took the latter course, attacked Snorro at his residence, Reykjaholt, and slew him, September 22, 1241.

Snorro is the author of the *Edda* and of the *Sagas of the Norwegian Kings*. The *Edda*, now called the Prose Edda, to distinguish it from the Poetic or Sæmund's Edda, was finished in 1222, and consists of three parts. The *Sagas of the Norwegian Kings* gives a connected series of biographies of the kings of Norway down to Sverri in 1177; here the author stops, because the history of Sverri and his successors had already been written.

SNOW. See METEOROLOGY.

SNOWDROP, *Galanthus nivalis*, is the best-known representative of a small genus of Amaryllids, all the species of which have bulbs, linear leaves, erect flower-stalks, destitute of leaves but bearing at the top a solitary pendulous bell-shaped flower. The white perianth is six-parted, the outer three segments being larger and more convex than the inner series. The six anthers open by pores or short slits. The ovary is three-celled, ripening into a three-celled capsule. The snowdrop is a doubtful native of Great Britain, but is largely cultivated for market in Lincolnshire. There are numerous varieties, differing in the size of the flower and the period of flowering. The double form is probably the least attractive.

SNOW-SHOES are a kind of foot gear used by Indians and trappers in Canada for traveling over the frozen surface of snow. The framework of a snow-shoe consists of a long narrow piece of pliable hickory wood, placed edgeways and then bent round with an oval-shaped front, and is adorned on the sides with tufts of crimson wool. The ends taper gradually to the rear, where they are fastened firmly to each other. The total length is about thirty-nine inches and the width from thirteen to sixteen inches. Across the oval, and fitted into the inside of the framework by mortises, are two battens of wood, five or six inches clear of both ends. Over the front one at an open space a deerskin thong is fastened, forming an aperture for the reception of the great toe. The thong is then crossed over the top of the foot, passed round and tied to the sides. This leaves the heel free to move up and down on the shoe and rests the weight of it on the toes. Over the remainder of the oval is stretched a network of tightly drawn strips of leather. On using the implements the knees must be turned inward and the fore part of the feet outward to avoid wounding the ankles with the frameworks. At first the fatigue and consequent stiffness are great; but with practice this wears off and the motions become easy. The speed attained as compared to that in skating is not quick.

SNUFF. See TOBACCO.

SNYDERS, FRANZ, painter of animals and still life, was born at Antwerp in 1579. In 1593 he was studying under Peter Breughel, and afterward he received instruction from Henry van Balen, the first master of Vandyke. His composition is rich and varied, his drawing correct and vigorous, his touch bold and thoroughly expressive of the different textures of the furs and skins of the animals represented. His excellence in this department excited the admiration of Rubens, who frequently employed him to paint animals, fruit, and still life in his own pictures, and he assisted Jordaens in a similar manner. Snyders died at Antwerp in 1657.

SOAP may in general terms be defined as a chemical compound resulting from the union of fatty oils and fats with alkaline bodies. Soap both as a medicinal and as a cleansing agent was known to Pliny (*H.N.*, xxviii. 51), who speaks of two kinds—hard and soft—as used by the Germans. He mentions it as originally a Gallic invention for giving a bright hue to the hair ("rutilandis capi'lis"). There is reason to believe that soap came to the Romans from Germany, and that the detergents in use in earlier times and mentioned as soap in the Old Testament (Jer. ii. 22; Mal. iii. 2, etc.), refer to the ashes of plants and other such purifying agents.

Till Chevreul's classical researches on fatty bodies (1811–23) it was believed that soap consisted simply of a binary compound of fat and alkali. Claude J. Geoffroy in 1741 pointed out that the fat or oil recovered from a soap solution by neutralization with a mineral acid differs from the original fatty substance by dissolving readily in alcohol, which is not the case with ordinary fats and oils. The significance of this observation was overlooked; and equally unheeded was a not less important discovery by Scheele in 1783. In preparing lead plaster by boiling olive oil with oxide of lead and a little water—a process palpably analogous to that of the soap-boiler—he obtained a sweet substance which, called by himself "Oelsüss" ("principium dulce oleorum"), is now known as "glycerine." These discoveries of Geoffroy and Scheele formed the basis of Chevreul's researches by which he laid bare the constitution of oils and the true nature of soap. (See OILS).

The general characteristics of a soap are a certain greasiness to the touch, ready solubility in water, with formation of viscid solutions which on agitation yield a tenacious froth or "lather," an indisposition to crystallize, readiness to amalgamate with proportions of hot water into homogeneous slimes, which on cooling set into jellies or more or less consistent pastes. Soaps give an alkaline reaction and have a decided acrid taste; in a pure condition—a state never reached in practice—they have neither smell nor color. Soap when dissolved in a large amount of water suffers hydrolysis, with formation of a precipitate of alkaliferous fatty acid and a solution containing free alkali. Its cleansing power is ordinarily explained by this reaction; but it is difficult to see why a solution which has just thrown off most of its fatty acids should be disposed to take up even a glyceride. It is more likely that the cleansing power of soap is due to the inherent property of its solution to emulsionize fats.

Resin soaps are compounds of soda or potash with the complex acids (chiefly abietic) of which coniferous resins consist. Their formation is not due to a true process of saponification; but they occupy an important place in compound soaps.

As regards processes of manufacture soaps may be made by the direct combination of fatty acids, separated from oils, with alkaline solutions. In the manufacture of stearin for candles, etc., the fatty matter is decomposed, and the liquid olein, separated from the solid fatty acids, is employed as an ingredient in soap-making. A soap so made is not the result of saponification but of a simple combination, as is the case also with resin soaps. All other soaps result from the combination of fatty oils and fats with potash or soda solutions under conditions which favor saponification.

Among the raw materials used by the soap-boiler the principal fatty bodies are tallow, lard, palm oil, palm-kernel oil, olive oil, cotton-seed oil, sesame oil, and cocoa-nut oil for hard soaps, and fish oils, linseed oil, marrow fat, and the lower qualities of other oils obtained by extraction, etc., for potash or soft soaps. Almond oil, spermaceti, cocoa-butter, ground-nut oil, and some others form the basis of certain toilet and medicinal soaps. Resin and colophony form essential ingredients in yellow soaps. The alkalies are used almost exclusively in the condition of caustic lyes—solutions of their respective hydrates in water.

The process of soap-boiling is carried out in large iron boilers called "soap pans" or "coppers," some of which have capacity for a charge of thirty tons or more. Formerly the pans were heated by open firing from below; but now the almost universal practice is to boil by steam injected from perforated pipes coiled within the pan, such injection favoring the uniform heating of the mass and causing an agitation favorable to the ultimate mixture and saponification of the materials. Direct firing is used for the second boiling of the soap mixture; but for this, superheated steam may with advantage be substituted, either applied by a steam-jacket round the pan or by a closed coil of pipe within it. In large pans a mechanical stirring apparatus is provided, which in some cases, as in Morfit's steam "twirl," is formed of the steam-heating tubes geared to rotate.

In the manufacture of Curd Soap in Germany tallow is the principal fat; in France olive oil occupies the chief place and the product is known as Marseilles or Castile soap, and in England tallow and palm oil are largely used. But in all countries a mixture of several oils enters into the composition of curd soaps and the proportions used have no fixity. For each ton of soap to be made, from twelve to sixteen hundredweights of oil is required. The soap pan is charged with the tallow or other fat, and open steam is turned on. So soon as the tallow is melted a quantity of weak lye is added, and the agitation of the injected steam causes the fat and lye to become intimately mixed and produces a milky emulsion. As the lye becomes absorbed, a condition indicated by the taste of the goods, additional quantities of lye of increasing strength are added. After some time the contents of the pan begin to clear and become in the end very transparent. Lye still continues to be poured in till a sample tastes distinctly alkaline—a test which indicates that the whole of the fatty acids have been taken up by and combined with the alkali. Then without further addition of alkali the boiling is continued for a few minutes, when the soap is ready for salting out or "graining." Either common salt or strong brine in measured quantity is added to the charge, and, the soap being insoluble in such salt solution, a separation of constituents takes place: the soap collects on the surface in an open granular condition, and the spent lye sinks to the bottom after it has been left for a short time to settle. Supposing now that a pure soap without resin is to be made—a product little seen in the market—the spent lye is run off, steam is again turned on, pure water or very weak lye run in, and the contents boiled up till the whole is thin, close, and clear. The soap is from this again grained off or salted out, and the underlye so thrown down carries with it colored impurities which may have been in the materials or which arise from contact with the boiler. Such washing process may have to be repeated several times when impure materials have been used. The spent lye of the washing being drained off, the soap now receives its strengthening boil. Steam is turned on, and, the mass being brought to a clear condition with weak lye or water, strong lye is added and the boiling continued with close steam till the lye attains such a state of concentration that the soap is no longer soluble in it, and it will separate from the caustic lye as from a common salt solution. The contents of the pan are once more allowed to cool and settle, and the soap as now formed constitutes a pure curd soap, carrying with it some proportion of uncombined alkali, but containing the minimum amount of water.

A pure curd soap always carries with it into the cooling frame a considerable amount of colored impurity, such as iron sulphate, etc. When it is permitted to cool rapidly the coloring matter remains uniformly disseminated throughout the mass; but when means are taken to cause the soap to cool and solidify slowly a segregation takes place; the stearate and palmitate form a semi-crystalline solid, while the oleate, solidifying more slowly, comes by itself into translucent veins, in which the greater part of the colored matter is drawn. In this way mottled or marbled soap is formed. Yellow soap consists of a mixture of any hard fatty soap with a variable proportion—up to 40 per cent. or more—of resin soap. The ordinary method of adding resin consists in stirring it in small fragments into the fatty soap in the stage of clear-boiling; but a better result is obtained by separately preparing a fatty soap and the resin soap, and combining the two in the pan after the underlye has been salted out and removed from the fatty soap. The compound then receives its strengthening boil, after which it is fitted by boiling with added water or weak lye, continuing the boil till by examination of a sample the proper consistency has been reached. Cocoa-nut soap is usually prepared by the so-called cold method, in which the fat heated to 80° C. is treated with a calculated quantity of caustic soda solution of sp. gr. 1.350, the two constituents being stirred together till the setting and hardening of the combination prevents further agitation. The property that cocoa-nut soap possesses of absorbing large proportions of water, and yet presenting the appearance of a hard solid body, makes the material a favorite basis for highly sophisticated compounds, in which water, sulphate of soda, and other alkaline solutions, soluble silicates, fuller's earth, starch, etc., play an important and bulky part. Cocoa-nut soap is little prepared by itself; but it forms a principal ingredient in compound soaps meant to imitate curd and yellow soaps. A further means of enabling a soap to contain large proportions of water and yet present a firm consistence is found in the use of silicate of soda. The silicate in the form of a concentrated solution is crutched or stirred into the soap in a mechanical mixing machine after the completion of the saponification, and it appears to enter into a distinct chemical combination with the soap. As already said, soft soaps are made with potash lyes, although in practice a small quantity of soda is also used to give the soap some consistence. There is no separation of underlyes in potash soap, consequently the product contains the whole constituents of the oils used, as the operation of salting out is quite impracticable owing to the double decomposition which results from the action of salt, producing thereby a hard, principally soda soap, with formation of chloride of potassium. Owing to this circumstance it is impossible to "fit" or in any way purify soft soap, and all impurities which go into the pan of necessity enter into the finished product. Soaps used in personal ablution in no way differ from the soaps previously alluded to, and may consist of any of the varieties. It is of consequence that they should, as far as possible, be free from excess of alkali and all other salts and foreign ingredients which may have an injurious effect on the skin. Transparent soaps are prepared by dissolving ordinary soap in strong alcohol and distilling off the greater portion of the alcohol till the residue comes to the condition of a thick, transparent jelly. This, when cast into forms and allowed to harden and dry slowly, comes out as transparent soap. A class of transparent soap may also be made by the cold process, with the use of cocoa-nut oil, castor oil and sugar. Toilet soaps of common quality are perfumed by simply melting and stirring into the mass some cheap odorous body that is not affected by alkalis under the influence of heat. The finer soaps are perfumed by the cold method; the soap is shaved down to thin slices, and the essential oil kneaded into and mixed with it by special machinery, after which it is formed into cakes by pressure in suitable molds. Glycerine soap ordinarily consists of about equal parts of pure hard soap and glycerine (the latter valuable for its emollient properties). The soap is melted by heat, the glycerine is stirred in, and the mixture strained and poured into forms, in which it hardens but slowly into a transparent mass. Soaps are also prepared in which large proportions of fine sharp sand, or of powdered pumice, are incorporated, and these substances, by their abrading action, powerfully assist the detergent influence of the soap on hands much begrimed by manufacturing operations. Medicated soaps contain certain substances which exercise a specific influence on the skin. A few medicated soaps are prepared for internal use, among which are croton soap and jalap soap, both gentler cathartics than the uncompounded medicinal principles. Medicated soaps for external use are only employed in cases of skin ailments and as prophylactic washes. Among the principal varieties are those which contain carbolic acid, petroleum, borax, camphor, chlorine, iodine, mercurial salts, sulphur, and tannin. Arsenical soap is very much employed by taxidermists for the preservation of the skins of birds and mammals. It consists of a mixture of white arsenic, hard soap, and slaked lime, say four ounces of each, with twelve ounces of carbonate of potash, the whole being made into a stiff paste with water.

To determine the water in a soap—a most important question—a few thin slices are weighed and dried in a stove at 105°C. so long as loss of weight continues. The loss of weight is the measure of uncombined water in the sample. Added salts, such as alkaline silicates, sulphates, etc., and insoluble earthy admixtures, are detected by boiling a sample with alcohol, in which only the soap proper dissolves. The residue is collected in a filter, washed with hot alcohol, and weighed. An excessive proportion of surplus alkali can be detected by dissolving the soap in hot water and adding a sufficiency of saturated solution of common salt to salt it out. The alkali remains in solution and can be determined by the amount of a standard acid solution it neutralizes

Marseilles has long been recognized as the most important center of the soap trade, a position that city originally achieved through its ready command of the supplies of olive oil. The city is still very favorably situated for obtaining supplies of oils both local and foreign, including sesame, ground nut, castor oil, etc. In England the soap trade did not exist till the sixteenth century.

SOAP BARK. A vegetable principle known as "saponin," and chemically analogous to the arabin of soluble gums and to mucilage, forms with water a lather, and is on that account available as a substitute for soap. Saponin is obtainable from soap nuts, the fruit of a tree, *Saponaria officinalis* and allied species; but its most important source is the Quillai bark of Chili yielded by a large tree, *Quillaja saponaria*. The inner bark of the tree, reduced to powder, is employed in Chili as a substitute for soap.

SOBIESKI, JOHN, king of Poland. See JOHN III. and POLAND.

SOCAGE is a form of tenure. Bracton, Britton, and other old writers derived the word from the French *soc*, "a plowshare." Modern etymologists, however, prefer to derive it from the Old English *soc*, "a franchise" or "privilege," or the land over which such franchise or privilege was exercised. Socage differs from knight service in being agricultural rather than military in its nature, and from frankalmoign in being based on temporal rather than spiritual services. It is either free or villein. Free socage *in capite* was abolished by 12 Car. II. c. 24. That form of free socage called common socage is the ordinary modern freehold tenure. Varieties of it are burgage, gavelkind, and petit serjeanty. Scutage, while it existed, was another variety. The only representative of villein socage is the comparatively rare tenure of ancient demesne confined to manors, described in Domesday Book as *terra regis*. Socage tenure is said to have formerly existed in Scotland. The descent of socage lands in Scotland seems to have been to all the sons equally, as was originally the case in England. (See BURGAGE, GAVELKIND, REAL ESTATE, SCUTAGE.)

SOCIALISM. The word "socialism" is of comparatively recent origin, having been coined in England in 1835. In that year a society which received the grandiloquent name of the "Association of all Classes of All Nations" was founded under the auspices of Robert Owen; and the word "socialist" and "socialism" were first used during the discussions which arose in connection with it. As Owen and his school had no esteem for the political reform of the time, and laid all emphasis on the necessity of social improvement and reconstruction, it is obvious how the name came to be recognized as suitable and distinctive. The term was borrowed from England by a distinguished French writer, Reybaud, in his well-known work the *Reformateurs modernes* (1839), in which he discussed the theories of Saint-Simon, Fourier, and Owen. Through Reybaud it soon gained wide currency on the Continent, and is now the accepted world-historic name for one of the most remarkable movements of the nineteenth century.

The central aim of socialism is to terminate the divorce of the workers from the natural sources of subsistence and of culture. The socialist theory is based on the historical assertion that the course of social evolution for centuries has gradually been to exclude the producing classes from the possession of land and capital and to establish a new subjection, the subjection of workers, who have nothing to depend on but precarious wage labor. The socialists maintain that the present system (in which land and capital are the property of private individuals freely struggling for increase of wealth) leads inevitably to social and economic anarchy, to the degradation of the working man and his family, to the growth of vice and idleness among the wealthy classes and their dependents, to bad and inartistic workmanship, and to adulteration in all its forms; and that it is tending more and more to separate society into two classes,—the wealthy millionaires confronted with an enormous mass of proletarians,—the issue out of which must either be socialism or social ruin. To avoid all these evils and to secure a more equitable distribution of the means and appliances of happiness, the socialists propose that land and capital, which are the requisites of labor and the sources of all wealth and culture, should become the property of society, and be managed by it for the general good. In thus maintaining that society should assume the management of industry and secure an equitable distribution of its fruits socialists are agreed, but in the most important points of detail they differ very greatly.

How are we to distinguish the socialism of the nineteenth century from old-world phenomena, and especially from the communism which has played so great a part in history? To this query socialists, especially of the school of Marx, have a clear and precise answer. Socialism is a stage in the evolution of society which could not arrive till the conditions necessary to it had been established. The first and most essential of these was the development of the great industrialism which after a long period of preparation and gradual growth began to reach its culminating point with the inventions and technical improvements, with the application of steam and the rise of the factory system in England toward the end of the eighteenth century. Under this system industry was organized into a vast social operation, and was thus already socialized; but it was a system that was exploited by the individual owner of the capital at his own pleasure and for his own behoof. Under the pressure of the competition of the large industry, the small capitalist is gradually crushed out, and the working producers become wage-laborers organized and drilled in immense factories and workshops. The development of this system still continues and is enveloping the whole world. Such is the industrial revolution. Parallel with this a revolution in the world of ideas equally great and equally necessary to the rise of socialism has taken place. This change of thought which made its world-historic announcement in the French Revolution made reason the supreme judge and had freedom for its great practical watchword. It was represented in the economic sphere by the school of Adam Smith. Socialism was an outcome of it too, and first of all in Saint-Simon and his school professed to give the positive and constructive corrective to a negative movement which did not see that it was merely negative and therefore temporary. In other words, Saint-Simon may be said to aim at nothing less than the completion of the work of Voltaire, Rousseau, and Adam Smith. Thus socialism professes to be the legitimate child of two great revolutions—of the industrial revolution which began to establish itself in England toward the end of the eighteenth century, and of the parallel revolution in thought which about the same time found most prominent expression in France. Robert Owen worked chiefly under the influence of the former; Saint-Simon and Fourier grew up under the latter. The conspiracy of Babeuf is properly to be regarded as a crude revolutionary communism not essentially different from the rude efforts in communism made in earlier periods of history. With Saint-Simon and Owen historic socialism really begins, and is no longer an isolated fact, but has had a continuous and widening development, the succession of socialistic teaching and propaganda being taken up by one country after another throughout the civilized world.

The beginning of socialism may be dated from 1817, the year when Owen laid his scheme for a socialistic community before the committee of the House of Commons on the poor law, the year also that the speculations of Saint-Simon definitely took a socialistic direction. The outlines of the history of socialism are very simple. Till 1850 there was a double movement in France and England. In the former country after Saint-Simon and Fourier the movement was represented chiefly by Proudhon and Louis Blanc. In England after Owen the movement was taken up by the body of Christian socialists associated with Maurice and Kingsley. The more recent socialism is due chiefly to German and also Russian thinkers, but is generally international both in sympathy and activity.

Considered as a purely literary and speculative product, the socialism of Fourier was prior to those of both Owen and Saint-Simon. His great work, *Théorie des Quatre Mouvements*, was published as early as 1808. The socialism of Fourier, however, scarcely attracted any attention and exercised no influence till those of Owen and Saint-Simon were on the decline. His system is one in which the wildest fantasy is mixed with ingenious theory and the most searching criticism of the present competitive system; even yet it is almost unrivaled in pungency and effectiveness.

The year 1830 was an important turning-point in the history of socialism. During the fermentation of that time the activity of the Saint-Simon school came to a crisis, and the ideas of Fourier had an opportunity of taking practical effect. Some of the Saint-Simonians joined him. The movement in France was short-lived; and the numerous experiments tried in America were not more successful. In 1839 Louis Blanc published his *Organisation du Travail*, and Cabet his *Voyage en Icarie*. In 1840 Proudhon published his book on property. At this period Paris counted among her visitors Lassalle, the founder of the social democracy of Germany; Karl Marx, the chief of scientific international socialism; and Bakunin, the apostle of anarchism.

The socialism of Saint-Simon and Fourier was largely speculative, imaginative, and utopian, and had only a very remote connection with the practical life of their time. With Louis Blanc (1811–1882) socialism came into real contact with the public history of France. The most conspicuous feature of Louis Blanc's teaching was that he demanded the democratic organization of the state as preparatory to social reorganization. His system, therefore, had a positive and practical basis, in so far as it allied itself to a dominant tendency in the existing state.

Compared with the parallel movement in France the early socialism of England had an uneventful history (see OWEN). In order to appreciate the significance of Owen's work it is necessary to recall some of the more important features of the social condition of the country in his time. The English worker had no fixed interest in the soil. He had no voice either in local or national government. He had little education or none at all. His dwelling was wretched in the extreme. The right even of combination was denied him till 1824. The wages of the agricultural laborer were miserably low. The workman's share in the benefits of the industrial revolution was doubtful. Great numbers of his class were reduced to utter poverty and ruin by the great changes consequent on the introduction of improved machinery; the tendency to readjustment was slow and continually disturbed by fresh change. The hours of work were mercilessly long. He had to compete against the labor of women, and of children brought frequently at the age of five or six from the workhouses. These children had to work the same long hours as the adults, and they were sometimes strapped by the overseers till the blood came. Destitute as they so often were of parental protection and oversight, with both sexes huddled together under immoral and insanitary conditions, it was only natural that they should fall into the worst habits, and that their offspring should to such a lamentable degree be vicious, improvident, and physically degenerate. In a country where the laborers had neither education nor political or social rights, and where the peasantry were practically landless serfs, the old English poor-law was only a doubtful part of an evil system. All these permanent causes of mischief were aggravated by special causes connected with the cessation of the Napoleonic wars, which are well known. It was in such circumstances, when English pauperism had become a grave national question, that Owen first brought forward his scheme of socialism (1817). In his communities, which were intended to be self-dependent units, Owen sought to provide the best education and the constant exercise of unselfish intelligence, to unite the advantages of town and country, and to correct the monotonous activity of the factory with the greatest variety of occupation, while utilizing all the latest improvements in industrial technique. The causes of Owen's failure in establishing his communities are obvious enough. Apart from the difficulties inherent in socialism, he injured the social cause by going out of his way to attack the historic religions and the accepted views on marriage, by his quixotry and tediousness, by refusing to see that for the mass of men measures of transition from an old to a new system must be adopted.

After the downfall of Owenism began the Christian socialist movement in England (1848–52), of which the leaders were Maurice, Kingsley, and Mr. Ludlow. The abortive Chartist demonstration of April, 1848, excited in Maurice and his friends the deepest sympathy with the sufferings of the English working class—a feeling which was intensified by the revelations regarding "London Labor and the London Poor," published in the *Morning Chronicle* (1849). Mr. Ludlow, who had in France become acquainted with the theories of Fourier, was the economist of the movement, and it was with him that the idea originated of starting coöperative associations. In *Politics for the People*, in the *Christian Socialist*, in the pulpit and on the platform, and in *Yeast* and *Alton Locke*, well-known novels of Kingsley, the representatives of the movement exposed the evils of the competitive system, carried on an unsparing warfare against the Manchester school, and maintained that socialism, rightly understood, was only Christianity applied to social reform. Their labors in insisting on ethical and spiritual principles as the true bonds of society, in promoting associations, and in diffusing a knowledge of coöperation were largely beneficial. In the north of England they joined hands with the coöperative movement inaugurated by the Rochdale pioneers (1844) under the influence of Owenism. Productive coöperation made very little progress, but coöperative distribution has proved a great success.

In 1852 the twofold socialist movement in France and England had come to a close, leaving no visible result of any importance. From that date the most prominent leaders of socialism have been German and Russian. To reach the beginnings of German socialism we must go back a little, as it took its rise in the years preceding the revolution of 1848. Its most conspicuous chiefs were Karl Marx, Friedrich Engels, Lassalle, and Rodbertus. The greatest and most influential of the four was unquestionably Marx, who, and his like-minded companion Engels, are the acknowledged heads of the "scientific and revolutionary" school of socialism, which has its representatives in almost every country of the civilized world, and is generally recognized as the most serious and formidable form of socialism.

The fundamental principle of the Marx school and of the whole cognate socialism is the theory of "surplus value," the doctrine, namely, that, after the laborer has been paid the wage necessary for the subsistence of himself and family, the surplus produce of his labor is appropriated by the capitalist who exploits it. This theory is an application of the principle that labor is the source of value, which was enunciated by many of the old writers on economics, such as Locke and Petty, which was set forth with some vagueness and inconsistency by Adam Smith, and was more systematically expounded by Ricardo. The socialistic application of the principle in the doctrine of surplus value had been made both by Owenites and chartists. It was to prevent this appropriation of surplus value by capitalists and middlemen that the Owen school tried the system of exchange by labor notes in 1832, the value of goods being estimated in labor-time, represented by labor notes. The principle that labor is the source of value has been accepted in all its logical consequences by Marx, and by him elaborated with extraordinary dialectical skill and historical learning into the most complete system of socialism that has ever been formulated.

The great work of Marx may be described as an exposition and criticism of capital. But it is also indirectly an exposition of socialism, inasmuch as the historical evolution of capital is governed by natural laws, the inevitable tendency of which is toward socialism. It is the great aim of Marx to reveal the law of the economic movement of modern times.

The first and most conspicuous result of the capitalistic system is that, while production is a social operation carried on by men organized and associated in factories, the product is appropriated by individual capitalists: it is social production and capitalistic appropriation. Another conspicuous and important result is that, while we have this organization in the factories, we have outside of them all the anarchy of competition. We have the capitalistic appropriators of the product of labor contending for the possession of the market, without systematic regard to the supply required by that market—each one filling the market only as dictated by his own interest, and trying to outdo his rivals by all the methods of adulteration, bribery, and intrigue—an economic war hurtful to the best interests of society. With the development of the capitalistic system machinery is more and more perfected, for to neglect improvement is to succumb in the struggle; the improved machinery renders labor superfluous, which is accordingly thrown idle and exposed to starvation. But, as the technique improves, the productive power of industry increases, and continually tends more and more to surpass the available needs of the market, wide as it is. The consequence is that the market tends to be overstocked even to absolute repletion; goods will not sell, and a commercial crisis is established, in which we have the remarkable phenomenon of widespread panic, misery, and starvation resulting from a superabundance of wealth—a "crise pléthorique," as Fourier called it, a crisis due to a plethora of wealth. These crises occur at periodic intervals, each one severer and more widespread than the preceding, until they now tend to become chronic and permanent, and the whole capitalistic world staggers under an atlantean weight of ill-distributed wealth. Thus the process goes on in obedience to its own inherent laws. Production is more and more concentrated in the hands of mammoth capitalists and colossal joint-stock companies, under which the proletariat are organized and drilled into vast industrial armies. But, as crisis succeeds crisis, until panic, stagnation, and disorder are universal, it becomes clear that the bourgeoisie are no longer capable of controlling the industrial world. The incompatibility between social production and anarchic distribution decidedly declares itself. With the progress of democracy the proletariat seizes the political power, and through it at last takes complete control over the economic functions of society. It expropriates the private capitalist and appropriating the means of production manages them in its own interest, which is the interest of society as a whole; society passes into the socialistic stage through a revolution determined by the natural laws of social evolution, and not by a merely arbitrary exercise of power. It is a result determined by the inherent laws of social evolution, independent of the will and purpose of individual men. All that the most powerful and clear-sighted intellect can do is to learn to divine the laws of the great movement of society, and to shorten and alleviate the birth-pangs of the new era. The efforts of reactionaries of every class to turn the wheel of history backward are in vain. But an intelligent appreciation of its tendencies and a willing coöperation with them will make progress easier, smoother, and more rapid.

It will be seen that the work of Marx is a natural history of capital, especially in its relation to labor, and in its most essential features is a development of two of the leading principles of the classic economics—that labor is the source of value, but that of this value the laborer obtains for himself merely a subsistence wage, the surplus being appropriated by the exploiting capitalist. Marx's great work may be described as an elaborate historical development of this glaring fundamental contradiction of the Ricardian economics, the contradiction between the iron law of wages and the great principle that labor is the source of wealth.

The opinions of Marx were destined to find expression in two movements, which have played a considerable part in recent history—the International and the social democracy of Germany. Of the International Marx was the inspiring and controlling head from the beginning; and the German social democracy, though originated by Lassalle, before long fell under Marx's influence. Marx wrote the famous inaugural address of the International and drew up its statutes, maintaining a moderation of tone which contrasted strongly with the outspoken vigor of the communist manifesto of 1847. But it was not long before the revolutionary socialism which underlay the movement gained the upper hand. This found strongest expression in the address drawn up by Marx in 1871 after the suppression of the commune, and entitled *The Civil War in France.* The International was not responsible for the revolt of the commune, which was a rising for the autonomy of Paris, supported chiefly by the lower classes. It was a protest against excessive centralization raised by the democracy of Paris, which has always been far in advance of the provinces, and which found itself in possession of arms after the siege of the town by the Germans. But, while it was prominently an assertion of local autonomy, it was also a revolt against the economic oppression of the moneyed classes, and thus contained within it strong socialistic tendencies. The socialists properly so called were only a small minority. In this address, however, Marx and his associates made themselves morally *solidaire* with the commune. They saw in it a great rising against the existing conditions of the Parisian proletariat, which only partially saw the way of deliverance, but was tired of oppression and full of just indignation against the tyrannous upper classes, that controlled the central government of France. This address, if it tended to increase the prestige of the International, greatly reduced its real influence. Its last meeting as controlled by Marx took place at The Hague in 1872. The chief himself was present, and succeeded in casting out the anarchist following of Bakunin; but it was the expiring effort. (See INTERNATIONAL.)

This loss of influence by Marx was in the meantime more than compensated by his success in gaining control over the social democracy of Germany. Of the workmen's unions which had grown so rapidly in Germany in the years following 1860, and which had first been patronized by the Progressist party, some had attached themselves to the national socialism of Lassalle, but many held aloof from that movement, and under the influence of Liebknecht and Bebel were gradually drawn over to the views of Marx. At Lassalle's death in 1864 his "general working-men's union of Germany" numbered only 4,610 members. After losing its founder the union had a changeful and somewhat precarious career for a time; and it was only under the presidency of Von Schweitzer, which lasted for four years (1867–1871), that it began moderately to flourish. In the meantime the adverse party also made considerable progress. The confederation of German unions, which was founded in 1863, declared in 1865 for universal suffrage, pronounced against the Schulze-Delitzsch schemes in 1866, and in the congress at Nuremberg of 1868 by a large majority declared their adhesion to the International. In a great congress at Eisenach in 1869 they founded the "social democratic working-men's party," and in the same year sent representatives to the International congress at Basel. Great efforts were made for a fusion of the Eisenach and the Lassalle party, and this was effected in a congress at Gotha (May, 1875). At this congress 25,000 regular members were represented, of whom 9,000 belonged to the Marx party and 15,000 to that of Lassalle. The united body assumed the name of the "socialistic working-men's party of Germany," and drew up a programme.

By this time the socialism of Germany began to be a power, which was calculated to excite grave alarm among the ruling classes. The social democrats had returned five members to the North German diet in 1867. For the German diet in 1871 they had counted only 120,000 votes, and returned two members; but in 1877 they had returned twelve members and polled nearly half a million. In Berlin the socialist voting strength had risen from 6,695 in 1871, to 57,511 in 1878—an increase which was all the more remarkable that Lassalle could hardly obtain a hearing in the capital when he commenced his career. A much more significant feature of the movement was the admirable state of organization to which the socialist propaganda had attained. A large number of skillful, intelligent, and energetic agitators spread their doctrines throughout Germany; a whole machinery of newspapers, pamphlets, treatises, social gatherings, and even almanacs diffused the new creed. In all the great centers of population, in Berlin, Hamburg, and the industrial towns in Saxony and on the Rhine, the socialists were rapidly tending to become the strongest party. The government accordingly intervened with exceptional legislation, which in 1878 was carried during the excitement occasioned by the attempts on the emperor's life of Hödel and Nobeling. These exceptional laws, though administered with great rigor, have not by any means succeeded in arresting the progress of the movement, as at the election to the Reichstag in 1890, the socialists won a most decided victory over the policy of repression which the government had inaugurated.

At that election which was held in February the Socialists, German Liberals, People's Party, Hanoverians, Danes, and Poles, with other but less powerful political organizations were arrayed against the policy of the government as promulgated by Bismarck and indorsed by the German Conservative, the German Imperial and the National Liberal parties. There were 7,228,552 votes cast, resulting in the election of representatives by the government almost if not wholly equal to the number elected by the Socialists. The Central or church party held the balance of power, while the strength of the parties not now enumerated was scattered indiscriminately. At the convening of the Reichstag the church party became identified with the Socialists, and at the first vote taken upon measures that called for an expression of opinion in respect to the past and future policy of the government, Bismarck, as will be remembered, encountered defeat both pronounced and humiliating. The practical effect of the victory thus achieved was a material advance of the Socialistic movement not only in Germany but elsewhere, the retirement from public life of Bismarck after more than fifty years' services, nearly half of which period he filled the position of Germany's Imperial Chancellor, and formulated and enforced policies that not only made for the empire but placed their author in the very front rank of European diplomatists and statesmen.

The participation of the Catholic Church of Germany in the social question dates from the period of the Lassalle agitation. In 1863 Döllinger recommended that the church should intervene in the movement, and Bishop von Ketteler of Mainz lost no time in expressing sympathy with Lassalle. In a treatise entitled *Die Arbeiterfrage und das Christenthum* (1864) Ketteler criticises the liberalism of the Manchester school in substantially the same terms as Lassalle, and recommends the voluntary formation of productive associations with capital supplied by the faithful. In 1868 the Catholic socialism of Germany took a more practical form; it started an organ of its own and began to organize unions for the elevation of the working men.

The socialist activity of the Protestant Church of Germany dates from 1878. The most important literary product of the movement is a work by Pastor Todt entitled *Der radikale deutsche Socialismus und die christliche Gesellschaft.* The chief leader of the movement is the court preacher Stöcker, the head also of the anti-Semitic agitation, which is largely traceable to economic causes. Stöcker founded two associations—a central union for social reform, consisting of members of the middle classes interested in the emancipation of labor, and a Christian social working-men's party. The former has had considerable success, especially among the Lutheran clergy. The movement has met with the most strenuous resistance from the social democratic party and has been greatly hampered by the anti-socialist law of 1878.

Little can here be said of the state socialism of Bismarck. Its leading principles were announced in an imperial message to the Reichstag in November, 1881. Besides the repressive measures necessary to restrain the excesses of the social democracy, the emperor declared that the healing of social evils was to be sought in positive measures for the good of the working man. The measures proposed were for the insurance of the workmen against accident, sickness, old age, and inability to work, by arrangements under state control. These expressions, however, have never borne the fruit they promised, and the government is yet decidedly antagonistic to socialism.

The acknowledged father of anarchism is PROUDHON (*q.v.*), but the doctrine owes its development chiefly to Russian thinkers who have been trained in the Hegelian left. The great apostle of the system in its advanced and most characteristic stage was Michael Bakunin. Bakunin was sprung from the highest Russian aristocracy, and was born at Torshok, in the government of Tver, in 1814. Leaving the army, in which he served for some time, he visited western Europe, chiefly Paris, where he met George Sand and Proudhon in 1847. For his share in the German disturbances of 1849 he was imprisoned in Russia for several years and then sent to Siberia, from which he escaped, and spent the rest of his life in exile in western Europe, principally in Switzerland. In 1869 he founded the Social Democratic Alliance, which, however, dissolved in the same year and entered the International. In 1870 he attempted a rising at Lyons on the principles afterward exemplified by the Paris commune. At the Hague congress of the International in 1872 he was outvoted and expelled by the Marx party. Bakunin's activity was most remarkable as an agitator. The international socialism of the Romance countries, especially that of Spain and Italy, has been largely molded by him. He died at Bern in 1876. Nothing can be clearer or more frank and comprehensive in its destructiveness than the socialism of Bakunin. It is revolutionary socialism based on materialism and aiming at the destruction of external authority by every available means. He rejects all the ideal systems in every name and shape, from the idea of God downward; and he rejects every form of external authority, whether emanating from the will of a sovereign or from universal suffrage.

The anarchy of Bakunin is therefore essentially the same as that of Proudhon, but expressed without paradox, and with a destructive revolutionary energy which has seldom been equaled in history. What they both contemplate is a condition of human enlightenment and self-control in which the individual shall be a law to himself, and in which all external authority shall be abolished as a despotic interference with personal freedom. It is an ideal to which the highest religion and philosophy look forward as the goal of man, not as one, however, which can be forthwith reached through the wholesale destruction of the present framework of society, but through a long process of ethical and social improvement. The error of the anarchists consists in their impatient insistence on this proclamation of absolute freedom in the present debased condition of the great mass of the people in every class.

Bakunin, as we have seen, has had great influence on the socialism of the Romance countries. The important risings in Spain in 1873 were due to his activity; and the socialism of Italy has been largely inspired by him. In those countries, as well as in France and French Switzerland, anarchist doctrines of the same general tpye as that of Bakunin are still in vogue, and are advocated by men of mark in literature and science like Krapotkin and Elisée Reclus. The views of the propaganda which they represent were most clearly and distinctly brought out during the great anarchist trial at Lyons in 1883. What they aim at is the most absolute freedom, the most complete satisfaction of human wants, without other limit than the impossibilities of nature and the wants of their neighbors equally worthy of respect.

It is an interesting fact that socialism has taken its most aggressive form in that European country whose civilization is most recent. The revolutionary opinions of Russia are not the growth of the soil, and are not the natural and normal outcome of its own social development; they have been imported from abroad. Falling on youthful and enthusiastic temperaments which had not previously been inoculated with the principle of innovation, the new ideas have broken forth with an irrepressible and uncompromising vigor which has astonished the older nations of Europe. Another peculiarity of the situation is that the government is an autocracy served or controlled by a camarilla largely foreign both in origin and sympathy. In this case, then, we have a revolutionary party inspired by the socialism of western Europe fighting against a government which is also in many ways an exotic and is not rooted in the mass of the people. The chief support of the government is to be found in the reverence of the peasantry for the person and office of the czar, while the nihilists look upon the communal institutions of the country as their great ground of hope.

The period of speculation was succeeded by a period of socialistic propaganda, which naturally met with implacable opposition and merciless repression from the government. As they received no mercy, the nihilists determined to show none; and in 1878 began the terrible duel of the Russian revolutionists against the autocracy and its servants, which culminated in the violent death of Alexander II. in 1881.

How far we are to regard the revolutionary movement of Russia as cognate in principle with anarchism is not easy to determine. In despotic countries, where constitutional reform and opposition to government are not tolerated, resolute innovators are naturally driven to secret conspiracy and to violent action. What distinguishes the Russian revolutionary party from other movements of a like nature is the intensity of the enthusiastic devotion and self-sacrifice with which they have braved death, imprisonment, exile, and privation in every form and the calculating skill with which they have called the resources of modern chemistry to their aid. With regard to political reform many of their leaders have declared that they would be satisfied with constitutionalism. In the address sent to the emperor Alexander III. after the death of his father in March, 1881, the executive committee of the revolutionary party offered to submit unconditionally to a national assembly duly elected by the people. In this recognition of constitutionalism, as well as in the strongly centralized organization of their executive, the Russian revolutionary party are essentially at variance with anarchism. In economics they advocate a thoroughgoing collectivism.

While many socialists have announced lax views regarding marriage and the family, it cannot in view of popular misunderstanding be sufficiently emphasized that the essence of socialism is an economic change. It enunciates no special doctrine on the relation of the sexes. In common with other social reformers, socialists generally advocate the equality of the sexes and the emancipation of women; they object to the mercenary element so common in marriage; and they abhor prostitution as one of the worst and vilest of existing evils, believing, moreover, that it is a necessary result of the present distinction of classes and of the unequal distribution of wealth. The views of the anarchists have already been noted. In the Marx school there is a tendency to denounce the legally binding contract in marriage. But such views all belong to the accidents of socialism.

So with regard to religion. Socialism has been and still is very frequently associated with irreligion and atheism. The same remark applies to Continental liberalism, and partly for a like reason: the absolute governments of the continent have taken the existing forms of religion into their service and have repressed religious freedom. On religion as on marriage socialism has no special teaching. While the anarchists of the school of Bakunin would overturn all forms of religion and reject the idea of God, the social democrats of Germany in their Gotha programme of 1875 declare religion to be a private concern. As we have seen, Christian socialism is a considerable force in many European countries; and in many of the other schools, especially that of Louis Blanc, the kinship and even identity of ethical spirit with that of Christianity are unmistakable.

In their revolutionary impatience the anarchists have avowed their hostility to all the existing political forms except the free commune, which alone will be left standing amid the general wreck they contemplate. The Marx school, as represented by its ablest living exponent, Friedrich Engels, also look forward to a period in the evolution of society when the state will become superfluous, and, having no longer any function to perform, will die away. The state they regard as an exploiting institution, an organization of the ruling classes for retaining the workers in economic subjection. The International was an attempt to supersede the exploiting states by a combination of the workers of all countries without distinction of creed, color, or nationality. When the workers in the name of the whole society seize political power and take over the control of production, the rule of classes, their conflicts and the excesses of the struggle for existence among them, will cease. Instead of a government over persons we shall have an administration of things and the control of productive processes.

SOCIETIES. Under ACADEMY will be found an account of the various bodies of which that word forms part of the titles, usually denoting some kind of state support or patronage. The present article is restricted to scientific, archæological, and literary societies, chiefly those founded and carried on by private collective effort.

In their modern form, learned and literary societies have their origin in the Italian academies of the Renaissance; but private scientific societies have arisen chiefly during the nineteenth century, being due to the necessity of increased organization of knowledge, and the desire among scholars for a common ground to meet and compare results and collect facts for future generalization. These bodies rapidly tend to increase in number and to become more and more specialized. Many efforts have been made from time to time to tabulate and analyze the literature published in their proceedings, as, for instance, in the indexes of Reuss (1801–21) and the Royal Society (1867–79) for physics and natural science, and those of Walther (1845), and Koner (1852–56) for history. A further development of the work done by societies was made in 1822, when, chiefly owing to Humboldt, the *Gesellschaft deutscher Naturforscher und Aerzte* first met at Leipsic. This inauguration of the system of national congresses was followed in 1831 by the *British Association for the Advancement of Science*, which has served as the model for similar societies in France, America, and elsewhere. The merit of introducing the idea of migratory congresses into France is due to the distinguished archæologist, M. Arcisse de Caumont (1802–73), who established the *Association Normande*, which since 1845 has held a reunion in one or other of the towns of the province for the discussion of matters relating to history, archæology, science, and agriculture, with local exhibitions. From the same initiation came the *Congrès Archéologique de France* (1834), which was organized by the *Société Française pour la Conservation des Monuments Historiques*, the *Congrès Scientifique*, which held its first meeting at Caen in 1833 (directed by the *Institut des Provinces*), and the *Congrès des Sociétés Savantes des Départements*, which for many years after 1850 held its annual sittings at Paris. The idea received the sanction of the French Government in 1861, when a *Congrès des Sociétés Savantes* was first convoked at the Sorbonne by the minister of public instruction. In Italy Charles Bonaparte, prince of Canino, started an association with like objects, which held its first meeting at Pisa in 1839. Russia has had an itinerant gathering of naturalists since 1867.

SOCIETY ISLANDS. See TAHITI ARCHIPELAGO.

SOCINUS, the Latinized form of the Italian Soccini, Sozini, or Sozzini.

I. LELIO FRANCESCO MARIA SOZINI, theological inquirer, was born at Siena on January 29, 1525. His family descended from Sozzo, a banker at Percena, whose second son, Mino Sozzi, settled as a notary at Siena in 1304. Mino Sozzi's grandson, Sozzino (d. 1403), was the ancestor of a line of patrician jurists, of whom Mariano Sozzini, senior (1397–1467), was the first and the most famous. Lelio was the sixth son of Mariano Sozzini, junior (1482–1556), by his wife Camilla Salvetti. The family name is variously spelled (usually "Soccini" by modern writers); Lelio invariably uses the form "Sozini," Latinizing it "Sozinus;" his nephew FAUSTO (see below) writes "Sozzini" and "Socinus." Sozini was educated as a jurist under his father's eye at Bologna. According to Melanchthon, it was his desire to reach the *fontes juris* which led him to Biblical studies and hence to the rejection of "the idolatry of Rome." Later on he acquired some knowledge of Hebrew and Arabic (he gave to Bibliander a manuscript of the Koran) as well as Greek, but he was never a laborious student. His father supplied him with means, and on coming of age he went to Venice, the headquarters of the evangelical movement in Italy. A tradition first published by Sand in 1678, and amplified by subsequent writers, makes Sozini the leading spirit in certain alleged theological conferences at Vicenza, about 1546, which are said to have forecast the main positions of the Unitarian heresy; but the whole account, including the story of the flight of Sozini, must be rejected as mythical. At this period the standpoint of Sozini was that of evangelical Protestantism; his mental temper presents a singular union of enthusiastic piety with a love for the subtleties of theological speculation. It was at Chiavenna in 1547 that he came under the influence of a gentle mystic, Camillo of Sicily, surnamed "Renato," whose teaching anticipated at many points that of the early Quakers. Pursuing his religious travels, Sozini visited Switzerland, France, England, and Holland, returning to Switzerland at the close of 1548. We find him in 1549–50 at Geneva and Basel (with Sebastian Münster), but chiefly at Zurich, where he lodges with Pellican. He spends eleven months (July, 1550, to June, 1551) at Wittenberg, at first under Melanchthon's roof, then with Johann Forster for the improvement of his Hebrew. From Wittenberg Sozini returned to Zurich (end of 1551) after visiting Prague, Vienna, and Cracow. Political events attracted him back to Italy in June, 1552. Two visits to Siena (where freedom of speech was for the moment possible, owing to the shaking off of the Spanish yoke) brought him into fruitful contact with his young nephew Fausto. He was at Padua (not at Geneva, as is often said) at the date of Servetus' execution (October 27, 1553). Thence he made his way to Basel (January, 1554), Geneva (April), and Zurich (May), where he took up his abode.

Calvin, as well as Melanchthon, received Sozini with open arms. Melanchthon (though a phrase in one of his letters has been strangely misinterpreted) never regarded him with theological suspicion. To Calvin's keen glance Sozini's over-speculative tendency and the genuineness of his religious nature were equally apparent. Of all the Reformers Bullinger was Sozini's closest intimate, his warmest and wisest friend. Sozini's theological difficulties turned upon the resurrection of the body, predestination, the ground of salvation (these were the points on which he corresponded with Calvin), the doctrinal basis of the original gospel (queries addressed to Bullinger), the nature of repentance (to Rudolph Gualther), the sacraments (to Johann Wolff). Not till the fate of Servetus had directed his mind to the question of the Trinity did he throw out any doubts upon this subject. At Geneva, in April, 1554, he had uttered incautious remarks on the common doctrine, emphasized in a subsequent letter to Martinengo, the Italian pastor. Bullinger, warned by several correspondents (including Calvin), questioned Sozini as to his faith, and received from him an explicitly orthodox confession, afterward reduced to writing (July 15, 1555), with a frank reservation of the right of further inquiry. Fortified with the most influential introductions (including one from Calvin), he visited in 1558 the courts of Vienna and Cracow to obtain support for his appeal to the reigning duke of Florence. His object was to realize his own estate and secure that of his family. Well received out of Italy, Sozini (who does not appear to have got beyond Venice) found he could do nothing at home. The Inquisition had its eye on his family; his brother Cornelio was imprisoned at Rome; his brothers Celso and Camillo and his nephew Fausto were "reputati Luterani" at Siena, and Camillo had taken refuge in flight. In August, 1559, Sozini returned to Zurich, and we hear little more of him. His brief career ended on May 14, 1562.

II. FAUSTO PAOLO SOZZINI, theological writer, was born at Siena on December 5, 1539, the only son of Alessandro Sozzini, "princeps subtilitatum," by Agnese, daughter of Borghese Petrucci. His youth was spent in desultory reading at Scopeto, the country seat of his family. His early intellectual stimulus came from his uncle Celso, an *esprit fort*, though always nominally a Catholic, and the founder of the Accademia dei Sizienti (1554), of which Fausto was a member. In 1556 his grandfather's will made him independent by leaving him one-fourth of the family estates. Next year he was enrolled in the famous Accademia degli Intronati, the center of the intellectual life of Siena. About this time Panzirolo (*De Claris Legg. Interpp.*, not published till 1637) describes him as a young man of fine talent, and bespeaks for him a legal career. But Fausto despised the law, and preferred the writing of sonnets. He was suspected of Lutheranism in 1558–59; soon after he came of age (1561) he went to Lyons, being probably employed there in mercantile business; he revisited Italy after his uncle Lelio's death; we next find him enrolled for a short time in 1562 as a member of the Italian church at Geneva; he returned to Lyons next year. The evangelical position was not radical enough for him. His *Explicatio* (1562) of the proem to St. John's Gospel shows that already he attributed to our Lord an official instead of an essential deity; a letter of 1563 rejects the natural immortality of man (a position developed long after in his disputation with Pucci). Toward the end of 1563 he conformed again to the Catholic Church, and spent the next twelve years in Italy, partly at court. His unpublished letters show that he was in the service of Isabella de' Medici, Francesco's sister. This portion of his life is obscure, and he afterward regarded it as wasted. Till 1567 he continued to give some attention to legal studies. He found time to write (1570) his treatise *De Auctoritate S. Scripturæ*. In 1571 he was in Rome, perhaps with his patroness. At the end of 1575 he left Italy, and after Isabella's death (strangled by her husband in 1576) declined the overtures of Francesco, who pressed him to return. Sozzini now fixed himself at Basel, where he gave himself to close study of the Bible, began a poetic version of the Psalms, edited posthumous dialogues of Castellio, and, in spite of his increasing deafness, became a recognized center of theological discussion. One of these discussions was on the doctrine of salvation, with Jacques Couet. It resulted in a bulky treatise, *De Jesu Christo Servatore* (finished July 12, 1578), the circulation of which in manuscript appears to have commended his powers to the notice of Giorgio Biandrata (1515–1588), court physician in Transylvania.

Transylvania had for a short time (1559–71) enjoyed religious liberty under an antitrinitarian prince, John Sigismund. But the existing ruler, Christopher Báthori, favored the Jesuits, and it was an object with Biandrata to limit the "Judaic" tendencies of the antitrinitarian bishop, Francis Dávid (1510–1579), with whom he had previously acted. By the alleged discovery of a stain upon Biandrata's morals of the gravest sort his influence with Dávid was destroyed. Now Sozzini's scheme of doctrine encouraged the use of seemingly orthodox language in an heretical sense. Christ was to be called God, and invoked with divine honors, though without any inherent title to such homage. It occurred to Biandrata that, if Sozzini could convert the eloquent Dávid to this view, all would be well. Accordingly in November, 1578, Sozzini reached Kolozsvár (Klausenburg), and did his best, during a visit of four months and a half under Dávid's roof, to teach him the doctrine of the invocation of Christ. Though Sozzini did not (as Biandrata desired) urge the absolute necessity of this invocation, the result was a public explosion on Dávid's part against the cultus of Christ in any shape or form. His trial followed, on a charge of innovation. Sozzini hurried off to Poland before it began. He cannot be accused of a guilty complicity with what he calls the rage of Biandrata, for he was no party to the incarceration of Dávid at Déva, where the old man miserably perished in prison. Biandrata ultimately conformed to the Catholic Church; yet as late as 1584 Sozzini, always constant to the leanings of friendship, sought his patronage for his treatise *De Jesu Christi Natura*, in reply to the Calvinist Andrew Wolan. The remainder (1579–1604) of Sozzini's life was spent in Poland. Forced to leave Cracow in 1583, he found a home with a Polish noble, Christopher Morsztyn, whose daughter Elizabeth he married (1586). She died in the following year, a few months after giving birth to a daughter, Agnese, afterward the wife of Stanislau Wiszowaty. In 1587 the grand-duke Francesco died, and to this event Sozzini's biographers attribute the loss of his Italian property. The holy office at Siena disinherited him in October, 1590; but he was allowed a pension, which does not seem to have been paid. He began to publish under his own name. The consequence was that in 1598 a mob expelled him from Cracow, wrecking his house and grossly ill-using his person. Friends gave him a ready welcome at Luslawice, thirty miles east from Cracow; and here, having long been troubled with colic and the stone, he died on March 4, 1604.

SOCORRO, a town in a county of the same name in New Mexico, seventy-six miles south of Albuquerque junction on the Atchison, Topeka and Santa Fé railroad, is beautifully situated in the Rio Grande valley. It is the center of a silver and lead mining district, and has a stamp mill and smelting-works. Fruit-growing and cattle-breeding are prosecuted in the vicinity. The population, including old and new town, is about 5,000.

SOCOTRA, or SOCOTORA (Arabic *Sokotrá*), an island of the Indian Ocean, 150 miles from Cape Gardafui and about 220 from the Arabian coast. Its length from east to west is seventy-one miles, its greatest breadth twenty-two. A plain two to four miles wide skirts the greater part of the coast, while the interior is mountainous. The granite peaks behind Tamarída (a village on the north coast and the chief place in the island, but now much decayed) rise to a height of 4,000 feet, and a limestone chain connected with these runs north and south with an average height of about 1,900 feet. The climate is moist, but not unhealthy, with much rain, especially during the southwest monsoon. The population is about 5,000, of two distinct types. The nomad inhabitants of the uplands are a peculiar race, well built, with good features and long curling but not woolly hair; they resemble neither the Arabs nor the Somál. From 1876 to 1886 the sultan of Reshín was bound by treaty not to cede the island to a foreign power or allow settlements on it without the consent of England. In 1886 it was formally annexed by Great Britain.

The fauna and flora of Socotra are peculiar. As regards mammalia the civet cat is found, but the ordinary wild beasts of Arabia are unknown. The flora was studied by Professor Bailey Balfour in 1880, and his account of it is about to be published by the Royal Society of Edinburgh. The most valuable vegetable products are now, as in the Middle Ages, aloes and dragon's-blood. The Socotran aloes (the French *chicotin*) is esteemed the best in the world when unadulterated. In old times the ambergris of Socotra was also famous.

SOCRATES, son of the statuary Sophroniscus and of the midwife Phænarete, was born at Athens, not earlier than 471 nor later than May or June, 469 B.C. As a youth he received the customary instruction in gymnastics and music; and in after years he made himself acquainted with geometry and astronomy and studied the methods and the doctrines of the leaders of Greek thought and culture. He began life as a sculptor; and in the second century A.D. a group of the Graces, supposed to be his work, was still to be seen on the road to the Acropolis. But he soon abandoned art and gave himself to what may best be called education, conceiving that he had a divine commission, witnessed by oracles, dreams, and signs, not indeed to teach any positive doctrine, but to convict men of ignorance mistaking itself for knowledge, and by so doing to promote their intellectual and moral improvement. He was on terms of intimacy with some of the most distinguished of his Athenian contemporaries, and, at any rate in later life, was personally known to very many of his fellow-citizens. His domestic relations were, it is said, unhappy. The shrewishness of his wife Xanthippe became proverbial with the ancients, as it still is with ourselves. Aristotle, in his remarks upon genius and its degeneracy (*Rhet.*, ii. 15), speaks of Socrates' sons as dull and fatuous; and in Xenophon's *Memorabilia*, one of them, Lamprocles, receives a formal rebuke for undutiful behavior toward his mother.

Socrates served as a hoplite at Potidæa (432–429), where on one occasion he saved the life of Alcibiades, at Delium (424), and at Amphipolis (422). In these campaigns his bravery and endurance were conspicuous. But, while he thus performed the ordinary duties of a Greek citizen with credit, he neither attained nor sought political position. His "divine voice," he said, had warned him to refrain from politics, presumably because office would have entailed the sacrifice of his principles and the abandonment of his proper vocation. Yet in 406 he was a member of the senate. During the reign of terror of 404 the Thirty, anxious to implicate in their crimes men of repute who might otherwise have opposed their plans, ordered five citizens, one of whom was Socrates, to go to Salamis and bring thence their destined victim Leon. Socrates alone disobeyed. But, though he was exceptionally obnoxious to the Thirty—as appears, not only in this incident, but also in their threat of punishment under a special ordinance forbidding "the teaching of the art of argument"—it was reserved for the reconstituted democracy to bring him to trial and to put him to death. In 399, four years after the restoration and the amnesty, he was indicted as an offender against public morality. His accusers were Meletus the poet, Anytus the tanner, and Lycon the orator, all of them members of the democratic or patriot party who had returned from Phyle with Thrasybulus. The accusation ran thus: "Socrates is guilty, firstly, of denying the gods recognized by the state and introducing new divinities, and secondly, of corrupting the young." In his unpremeditated defense, so far from seeking to conciliate his judges, Socrates defied them. He was found guilty by 280 votes, it is supposed, against 220. Meletus having called for capital punishment, it now rested with the accused to make a counter-proposition; and there can be little doubt that, had Socrates without further remark suggested some smaller but yet substantial penalty, the proposal would have been accepted. But, to the amazement of the judges and the distress of his friends, Socrates proudly declared that for the services which he had rendered to the city he deserved, not punishment, but the reward of a public benefactor—maintenance in the Prytaneum at the cost of the state; and although at the close of his speech he professed himself willing to pay a fine of one mina, and upon the urgent entreaties of his friends raised the amount of his offer to thirty minas, he made no attempt to disguise his indifference to the result. His attitude exasperated the judges, and the penalty of death was decreed by an increased majority. Then, in a short address, Socrates declared his contentment with his own conduct and with the sentence. Whether death was a dreamless sleep or a new life in Hades, where he would have opportunities of testing the wisdom of the heroes and the sages of antiquity, in either case he esteemed it a gain to die. In the same spirit he refused to take advantage of a scheme arranged by his friend Crito for an escape from prison. Under ordinary circumstances the condemned criminal drank the cup of hemlock on the day after the trial; but in the case of Socrates the rule that during the absence of the sacred ship sent annually to Delos no one should be put to death caused an exceptional delay. For thirty days he remained in imprisonment, receiving his intimates and conversing with them in his accustomed manner. How in his last conversation he argued that the wise man will regard approaching death with a cheerful confidence, Plato relates in the *Phædo;* and, while the central argument—which rests the doctrine of the soul's immortality upon the theory of ideas—must be accounted Platonic, in all other respects the narrative, though not that of an eye-witness, has the air of accuracy and truth.

SOCRATES, church historian. In the course of the last twenty-five years (425–450) of the reign of Theodosius II. (the first thoroughly Byzantine emperor) at least six church histories were written in Greek within the limits of the Eastern empire—those, namely, of Philostorgius the Arian, of Philippus Sidetes, of Socrates, of Sozomen, of Theodoret, and of Hesychius. Of these the first, no longer extant except in fragments, seems to have been the most important. Those of Philip and of Hesychius (the former an untrustworthy and dreary performance) have also perished. The remaining three are now our main sources for church history from Constantine to Theodosius II. None of them has ventured upon a fresh treatment of the period dealt with by Eusebius; all three begin their narratives about the point where his closes. In the West the *Church History* of that author had already been continued by Rufinus and his *Chronicle* by Jerome, and the work of Rufinus was certainly known to the Byzantines. Nor did these write independently of each other, for SOZOMEN (*q.v.*) certainly had before him the work of Socrates, and THEODORET (*q.v.*) knew one or both of them. The three histories together became known in the West from the sixth century through the selection which Cassiodorus caused to be made from them, and it is to this selection (if we leave Rufinus and Jerome out of account) that the Middle Ages were mainly indebted for all they knew of the Arian controversies, and of the period generally between the councils of Nice and Ephesus.

The *’Εκκλεσιαστικὴ ‘Ιστορία* of Socrates, still complete, in several books, embracing the period from 306 to 439, was written about, or at all events not later than 440. He was born and brought up at Constantinople; the date of his birth is uncertain, but it can hardly have been before 385. Of the facts of his life we know practically nothing, except that he was not a cleric but a "scholasticus" or advocate. Of the occasion, plan, and object of his work he has himself informed us in the prologues to his first, second, fifth, and sixth books. It is dedicated to one Theodorus, who had urged him to write such a history. He had no thorough preparation for the task, and for the period down to the death of Constantius (361) was practically dependent on Rufinus. His work finished, he became a student of Athanasius and came to see how untrustworthy his guide had been. He accordingly rewrote his first two books, and it is only this revision that has reached us.

SODIUM AND SODA. Sodium is one of the two principal alkali metals, regarding the general properties of which the reader is referred to CHEMISTRY (*q.v.*), and POTASSIUM, (*q.v.*) In combination sodium is a generally diffused and most abundant element. The salt dissolved in sea water consists chiefly of chloride of sodium ($NaCl$), and according to Dittmar's calculation (see SEA WATER) the oceans of the world contain of sodium calculated as chloride not less than $36{,}000 \times 10^{12}$ (*i.e.*, 36,000 million million) tons, while of potassium calculated as sulphate the amount in sea water is $1{,}141 \times 10^{12}$ (1,141 million million) tons. From sea water have been deposited the enormous beds of rock salt found in many parts of the world (see SALT). Sodium carbonates are also widely dispersed in nature, forming constituents of many mineral waters, and occurring as principal saline components in natron or trona lakes, as efflorescences in Lower Egypt, Persia, and China, and as urao in Mexico, Colombia, and Venezuela. The solid crusts found at the bottom of the salt lakes of the Araxes plain in Armenia contain about 16 per cent. of carbonate and 80 of sulphate of soda. In New Granada there occurs a double salt, $Na_2CO_3 + CaCO_3 + 5H_2O$, known as gay-lussite. In Wyoming, California, and Nevada enormous deposits of carbonates, mixed in some cases with sulphate and with chloride, occur. About Szegedin in Hungary and all over the vast pusztas (steppes) between the Theiss and the Danube, and from the Theiss up to and beyond Debreczin, the soil contains sodium carbonate, which frequently assumes the form of crude alkaline crusts, called "szekso," and of small saline ponds. A purified specimen of such Debreczin soda was found to contain as much as 90 per cent. of real carbonate ($NaCO_3$) and four of common salt. Natural sulphate occurs in an anhydrous condition as thenardite (Na_2SO_4) at Tarapaca, Peru, and in the rock-salt deposits at Espartinas near Aranjuez, Spain. Hydrated sulphates occur at several localities in the province of Madrid and in other provinces of Spain, and at Mühlingen in Aargau, and copious deposits of glauberite, the double sulphate of sodium and calcium, are met with in the salt-mines of Villarrubia in Spain, at Stassfurt, and in the province of Tarapaca, Peru, etc. A native nitrate of soda is obtained in great abundance in the district of Atacama and the province of Tarapaca, and is imported into Europe in enormous quantities as cubical niter for the preparation of saltpeter (see NITROGEN). Cryolite, a fluoride of aluminium and sodium, $AlF_3 + 3NaF$, is extensively mined in Greenland for industrial purposes. These form the principal natural sources of sodium compounds—the chloride as rock salt and in sea water being of such predominating importance as quite to outweigh all the others. But it is questionable whether taken altogether the mass of sodium they represent is as much as that disseminated throughout the rocky crust in the form of soda felspar (*i.e.*, as silicate of soda) and in other soda-containing rocks. From this source all soils contain small proportions of sodium in soluble forms, hence the ashes of plants, although they preferably imbibe potassium salts, contain traces and sometimes notable quantities of sodium salts. Sodium salts also form essential ingredients in all animal juices.

Considered industrially, by far the most important bodies are the carbonates, the sulphates, and caustic soda (sodium hydrate), the manufacture of which forms the basis of the soda industry. Immense quantities of these bodies are used in the manufacture of soap and glass, and under the name of "washing soda" or "soda crystals" the consumption of the hydrated carbonate for domestic washing is also very great. There are indeed few chemical industries in which soda in one form or another does not play an important part, and the combinations of economic value into which it enters are numberless.

Sodium, in German *Natrium* (symbol, Na; atomic weight, 23.053; O=16), is a univalent metal. It occurs nowhere in nature in an uncombined condition, and was first isolated in 1807 by Sir Humphrey Davy through the medium of voltaic electricity. It is prepared by distillation of an intimate mixture of carbonate of soda with charcoal. The process is quite analogous to that followed in making metallic potassium (see POTASSIUM), but much easier of execution, and free from certain dangers which attend the preparation of the other. The distillation is conducted in cylindrical iron retorts protected against the fire by means of fire-clay tubes fitting closely round them. In the charge is included a certain proportion of chalk, which, giving off carbonic acid, aids in driving over the metallic vapor and protects the distillate against oxidation. The metal cast into the form of cakes or ingots is protected from the air by a coating of paraffin and secured in closely fitting soldered-up tinned-iron boxes. Metallic sodium is very similar in properties and appearance to potassium. The principal points of difference are its pure white color, its specific gravity (0.9735 at 13.5° C.), and its fusing point (95.6° C.) In thin layers its vapor is colorless, but dense fumes have a purple tint. It decomposes water violently, but the hydrogen evolved does not take fire, although the reaction is more dangerous than the corresponding phenomena developed by potassium, because it leads frequently to most violent explosions. Yet the process serves in practice for the preparation of pure soda hydrate. In this operation a piece of sodium is placed in a silver basin standing in a shallow cold-water bath. Drop by drop water is added—the metal between the additions being allowed to expend its energy—till the desired quantity of hydrate is formed. The process, in short, is so conducted that, except at first, the metal never touches water in any other form than that of a strong soda lye. Sodium is largely made for use as an agent in the manufacture of aluminium and magnesium, and as a reagent in laboratory operations. The metal does not affect carbonic oxide at any temperature; it acts on hydrogen as potassium does; but the compound is less stable. On ammonia gas it acts, as in the parallel case of potassium, with the formation of NH_2Na, only the reaction is less energetic. Sodium has less powerful affinity to oxygen than potassium; in dry air or oxygen it burns into the dioxide Na_2O_2—a product obtainable also by heating the nitrate or nitrite. A white solid soluble in cold water, forming a hydrate, $Na_2O_2 + 8H_2O$, is obtainable in crystals, the solution of which is strongly alkaline. With acids it yields sodium salts and peroxide of hydrogen. Sodium tetroxide (Na_2O_4) is not known to exist.

Caustic Soda (NaHO) is prepared from carbonate by means of caustic lime, just as caustic potash is made from its carbonate (see POTASSIUM). Compared with caustic potash, caustic soda is less easily soluble in water, less caustic, less energetically basilous, less prone when fused in air to pass into peroxide, hence less destructive to platinum, iron, nickel, and silver vessels.

Sodium Chloride (NaCl) occurs in nature in a nearly pure state. Absolutely pure salt is made from commercial salt by precipitating from a solution the lime and magnesia by pure carbonate of soda, filtering, neutralizing with pure hydrochloric acid, concentrating by evaporation, and then precipitating the pure salt by a stream of hydrochloric acid gas. The crystalline precipitate is collected over glass wool, washed with pure fuming hydrochloric acid dried by heating in a platinum basin. It forms non-hygroscopic crystals, free from combined water, having a specific gravity at 16° C. of 2.162 (Stolba), and according to Carnelley fusing at 776° C. The solubility of pure salt in water is almost independent of temperature. Regarding its commercial relations, etc., see SALT.

Chlorate of Soda ($NaClO_3$) is a salt of some industrial importance, from its use in the manufacture of aniline black. It may be made from the potash salt (*a*) by decomposing this with hydrofluosilic acid (which precipitates the potassium as fluosilicate and yields a solution of chloric acid), and neutralizing the chloric acid solution with soda, or (*b*) by double decomposition with bitartrate of soda, $NaHC_4H_4O_6$—the cream of tartar ($KHC_4H_4O_6$) separating out almost completely, while the chlorate of soda remains in solution. According to Weldon, it is best manufactured from caustic soda by the direct action of chlorine, the two salts NaCl and $NaClO_3$ being separated by crystallization. Chlorate of soda forms cubes which often exhibit tetrahedral faces; 100 parts of water dissolve at 0° 81.9, at 20° 99, and at 100° C. 233 parts of the salt. Hence it is much more soluble than the potash salt, on which account it is preferred for aniline black printing.

Sulphate (Na_2SO_4) is the most largely produced of all soda salts in manufacturing operations, although it is regarded principally as an intermediate product. The anhydrous salt readily combines with water into a crystalline soluble compound, $Na_2SO_4 + 10H_2O$, known as Glauber's salt. This forms large transparent monoclinic crystals, and is characteristically prone to form supersaturated solutions.

As the temperature rises beyond about 33°, the solubility decreases (Gay-Lussac). Glauber's salt, when exposed to dry air, especially in summer heat, gradually falls into a powder of anhydrous sulphate. It is much less volatile than the chloride. The thiosulphate, $Na_2S_2O_3$ (commercial hyposulphite of soda), and soda salts of other lower sulphur acids, are reserved for SULPHUR.

Of all sodium compounds, except common salt, the carbonates are by far the most important, both industrially and chemically. These comprise the following:

Normal Carbonate, Na_2CO_3.—The anhydrous salt usually presents itself in the form of a white opaque porous solid, specific gravity 2.65 (Karsten). According to Carnelley, it fuses at 818° C. (dull red heat) into a colorless liquid. On fusing it loses some of its carbonic acid, and at a bright red heat it volatilizes appreciably. The porous salt absorbs water from the air; when moistened with water it gives off heat and unites into crystalline hydrates, of which the important compound is

Decahydrate, $Na_2CO_3 + 10H_2O$.—This salt, known as soda crystals or washing soda, forms large transparent monoclinic rhomboidal prisms or double pyramids. The salt dissolves readily in water, forming strongly alkaline solutions, which emulsionize fats, though less readily than is done by caustic lyes.

The bicarbonate remains as a crystalline mass, while the liberated water runs off with more or less of dissolved carbonate and the saline impurities which may be present. Bicarbonate forms small four-sided monoclinic plates with a feebly alkaline taste and reaction.

Other salts of soda which are of importance on account of their acid constituents—nitrate, silicate, phosphate—are dealt with under NITROGEN, SILICA, PHOSPHORUS.

The estimation and analysis of alkalies are sufficiently dealt with at the close of the article POTASSIUM.

SODOM AND GOMORRAH. See DEAD SEA, comp. PHŒNICIA and LOT.

SODOMA, IL, or, more properly SODONA, Italian painter. GIANNANTONIO BAZZI (who until recent years was erroneously named RAZZI) appears to have borne also the name of "Sodona" as a family name; it is signed upon some of his pictures. While "Bazzi" was corrupted into "Razzi," "Sodona" was corrupted into "Sodoma;" and Vassari, followed by other writers on art, accounts for the latter name by giving various and explicit details which we leave undiscussed, for, if the painter did not really pass by the appellation of "Sodoma," we may fairly infer that explanations which would have been germane to that appellation are not germane to the man himself. Bazzi was born at Vercelli in Piedmont toward 1479, and appears to have been in his native place a scholar of the painter Giovenone. Bazzi afterward went to Siena, and at a later date went in quest of work to Pisa, Volterra, and Lucca. From Lucca he returned to Siena, not long before his death, which took place on February 14, 1549 (the older narratives say 1554). He had squandered his property and died in penury in the great hospital of Siena.

SOEST, an industrial town in Westphalia, Prussia, is situated in a fertile plain, twenty-seven miles to the east of Dortmund and thirty-four to the southeast of Münster. Its early importance is borne witness to by its six fine churches, and the Roman Catholic cathedral, founded in the tenth century by Bruno, brother of Otho the Great, though the present building was erected in the twelfth century. This last, with its very original façade, is one of the noblest ecclesiastical monuments of Germany. The population in 1880 was 13,985, and in 1890 16,000.

SOFÁLA, a seaport town on the east coast of Africa, at the mouth of a river of the same name to the south of 20° S. latitude, the seat of a Portuguese commandant. It is now a wretched place of about 1,000 inhabitants, with not more than twenty European residents, and, as its port is obstructed with sandbanks, there is only a small coasting trade with Chiluan and Inhambane.

SOFIA, since 1878 the capital of Bulgaria, though previously only a district town of the Tuna (Danube) vilayet of Turkey, is situated 1,755 feet above the sea, in the midst of a dreary plain between the Stara Planina or main range of the western Balkans and the bare but imposing granite mass of the Vitosh mountains (3,400 feet). It stands at the meeting of five great routes from Nish and Belgrade, Lom and Vidin, Plevna and Rustchuk, Philippopolis and Constantinople, and Köstendil and Salonica. It lies on the prospective great railway route between Constantinople and Belgrade, and was in the eyes of those who selected it the prospective capital of a much more extensive territory. The climate of Sofia is subject to severe seasonal and diurnal changes: in January the thermometer sinks 4° below zero and in August approaches 100°, and the daily range is frequently 27 or 28 degrees. Minarets and gardens give a certain beauty to the aspect of the town itself, but the outskirts are painfully destitute of foliage. In an eastern suburb stands the royal palace, a vast building which cost more than 4,000,000 francs, ($800,000) and in that neighborhood, on the site of an abandoned Turkish quarter, quite a new "European" town has sprung up. The rest of Sofia retains its Turkish character, with tortuous streets and mean wooden houses. The modern cathedral and the archbishop's palace are both large edifices of no special note. Of the many mosques the most striking is the Buyuk-Jami, with its nine metal cupolas; but more historical interest attaches to the Sophia mosque, occupying the highest point in the town to which it gave its name. Sofia exports hides and skins to Vienna, etc., and especially goat-skins to Marseilles; its principal imports are Indian corn, wheat, and alcoholic liquors—the last a very large item. Formerly the population was 50,000. In 1870 Kanitz found 19,000—a liberal estimate—8,000 being Bulgarians, 5,000 Turks, 5,000 Jews (a colony dating from the expulsion from Spain), 900 Gipsies. At present (1890) the total is 20,000.

SOGDIANA, or SOGDIANE, in Old Persian *Sughuda*, a province of the Achæmenian empire, the eighteenth in the list in the Behistun inscription of Darius (i. 16), corresponded to the modern districts of Samarkand and Bokhara; that is, it lay north of Bactriana between the Oxus and the Jaxartes and embraced the fertile valley of the Polytimetus or Zarafshan.

SOHÁR, the second port of 'Omán, Arabia, situated on the Gulf of 'Omán in 24° 22′ N. latitude and 56° 45′ E. longitude. It is a place of considerable trade and industry, well built, fortified with walls and a castle, and inhabited by a hospitable and far from bigoted population of the 'Ibádí sect. The anchorage is good, sheltered between two promontories, and the surrounding country is populous and fertile. Indeed the coastland of 'Omán is naturally the most favored part of Arabia.

SOISSONS, a city of France, in the department of Aisne, the seat of a bishopric and a fortified post on the left bank of the Aisne at the junction of the Crise, lies sixty-five miles northeast of Paris by the railway to Laon. The population in 1881 was 10,895, and is now (1890) 12,000. The cathedral of Notre Dame St. Gervais and St. Protais, begun in the second half of the twelfth century and finished about the end of the thirteenth, is 328 feet long and 87 wide; the vaulting of the nave is 100 feet above the pavement. The single tower dates from the middle of the thirteenth century and is a fairly good imitation of those of Notre Dame of Paris, which it equals in height (216 feet). The wealthiest of all the abbeys in Soissons and one of the most important of all France during the first two dynasties was that of St. Médard, on the right bank of the Aisne, founded in 560 by Lothaire I., beside the villa of Syagrius, which had become the palace of the Frankish kings. St. Médard, apostle of Vermandois, and Kings Lothaire and Sigebert were buried in the monastery, which became the residence of 400 monks and the meeting-place of several councils. It was there that Childeric III., the last Merovingian, was deposed and Pippin the Short was crowned by the papal legate; and there Louis the Pious was kept in captivity in 833. The civil buildings of Soissons are not of much interest. The hôtel de ville contains a museum with scientific and archæological collections; the hôtel dieu goes back to the thirteenth century; the library contains 40,000 volumes and curious manuscripts. Among the industrial establishments are tanneries, saw-mills, and foundries and factories for the production of stoves, agricultural implements, candles, and chocolate. Grain, flour, haricot beans of exceptional quality, peas, wool, hemp, flax, cattle, timber, and charcoal are the principal articles of trade. There is also a large bottle factory, and work is done for the flannel and blanket factories of Rheims.

SOKOTO, an important Fulah kingdom or empire in Central Soudan, comprising what are frequently called the Haussa states. Its boundaries are irregularly marked off by the plateau lands of Air or Asben on the north, the kindred Fulah state of Gandu on the west, while the river Binué practically forms its southern limit as far as the meridian of 10° E.; beyond this it runs south into the Congo basin. On the east lies the kingdom of Bornu. From northwest to southeast Sokoto has a length little short of 900 English miles, and its average breadth is about 280. The whole area has been roughly computed to be equal to that of Spain (about 195,000 square miles), and to have a population of from 10,000,000 to 12,000,000. The country may be described as a great undulating plain, rarely exceeding 1,000 feet in height, with the exception of the province of Bauchi in the center, which runs into a highland region with heights of 3,000 feet, and the still more imposing masses of Adamawa in the south, which are said to attain an altitude of 10,000 feet in Mount Alantika. In other respects Sokoto presents more varied features, chiefly determined by the amount of rainfall, though the varying fertility of the soil is a not unimportant factor. In the southern parts, where there are almost perpetual rains, large streams and rivers are numerous—the feeders of the Binué, the great eastern (left-hand) tributary of the Niger. Lying within the tropics, Sokoto is subject to excessive heat—damp and steamy in the south, dry and furnace-like in the north, where it suffers from the hot winds from the Sahara. In Adamawa the rainy season—or, to be more correct, the season of excessive rains—commences in April and lasts till October or later, while in Gober in the north the rains commence in June and seldom last more than three months, during which the country becomes transformed from a repellent desert into a well-cultivated nursery garden. For Central Africa Sokoto may be described as fairly healthy, though, as may be expected from a conjunction of excessive heat with excessive rain, fevers are not uncommon in the southern parts, while ophthalmia is prevalent in the north, especially among the poorer classes, who are compelled to expose themselves to the blinding dust from the deserts and the excessive glare of the sun reflected from the burning sands.

The natural productions of Sokoto are such as are more or less common throughout the whole of the SOUDAN, (*q.v.*) Among cereals rice and wheat are cultivated in many parts, though the staple productions are Kaffre corn, millet, and maize. Sweet potatoes, ground nuts, yams, onions, and other vegetables are largely grown. Of fruits, dates, pomegranates, citrons, and bananas abound in more restricted areas. The Shea butter tree supplies an excellent oil for lamps, and also for cooking, though it is only used by the poorer classes. The palm-oil tree is only found in the damp basin of the Binué. The most important vegetable products are cotton and indigo, which are universally grown. The cotton is manufactured into cloth, being used by the native population as well as largely exported to neighboring countries. In some parts a species of silk found in the forests is largely used, and the people of Yakoba in Bauchi are said to rear the silkworm. Of mineral products there seem to be few, though it is known that both silver and lead occur in the Binué area. Iron is extensively diffused and of excellent quality.

The chief provinces of Sokoto are Zamphoro, Zaria, Katsena, Bauchi, Kano, and Adamawa. The most important towns are—Sokoto, the acknowledged capital of the empire, famed chiefly for its leather-work and straw hats (it divides with Wurnu the distinction of being the residence of the sultan; Clapperton died here in 1837); Wurnu, about eighteen miles farther east, the present headquarters of the court; Kano, the great commercial emporium of Central Soudan; and Yakoba, chiefly noted for its large size—said to contain 150,000 inhabitants.

SOLON GOOSE. See GANNET.

SOLARIO, ANTONIO, a painter of leading importance in the Neapolitan school, is commonly called Lo Zingaro, or The Gipsy. His father is said to have been a traveling smith. Antonio was born at Civita in the Abruzzi, about 1382, although it is true that one of his pictures is signed "Antonio de Solario Venetus," which may possibly be accounted for on the ground that the signature is not genuine. Solario made an extensive round of study—first with Lippo Dalmasio in Bologna, and afterward in Venice, Ferrara, Florence, and Rome. On returning to Naples he rapidly took the first place in his art. His principal performance is in the court of the monastery of S. Severino—twenty large frescoes illustrating the life of St. Benedict, now greatly decayed; they present a vast variety of figures and details, with dexterous modeling and coloring. Sometimes, however, Lo Zingaro's color is crude, and he generally shows weakness of draughtsmanship in hands and feet. His tendency is that of a naturalist—the heads life-like and individual, and the landscape backgrounds better invented and cared for than in any contemporary. He died in 1455.

SOLDER is a metallic alloy or metal employed for cementing or binding together two metallic surfaces. The solder is applied to the surfaces to be united in a molten state, and it is therefore generally either a more fusible body than the metal to be acted on or it is presented in a more fusible condition. The process of autogenous soldering consists in uniting the individual metallic edges themselves by melting and fusing them in the heat of the oxyhydrogen blowpipe or by means of an ignited blast of mixed coal gas and air. Autogenous soldering is extensively used in connection with large plumber work. Ordinary solders are divided into hard and soft classes, the hard comprising such as require a red heat for their melting. The soft solders used by plumbers and tinsmiths consist of variable mixtures of lead and tin, and for pewterers' use bismuth is added to these. The hardest brazing solder has equal parts of copper and zinc, and for softer qualities increased amounts of zinc with tin and sometimes antimony are employed. For fine jewelry alloys of gold, silver, and copper are used; silver solder is employed for inferior qualities, and even common soft solder finds extensive employment in the jewelry trade. Silver is the proper solder for German silver manufactures also; and gold is the medium for joining the edges of platinum vessels. In soldering, the metallic edges to be united must be free from oxidation and dirt; and to keep them unoxidized during the operation several fluxes are used, such as borax in brass soldering, rosin and solution of zinc chloride for tin-plate, zinc chloride for zinc, rosin and tallow for lead and tin, and olive oil in pewter work. Special machinery has been devised for the soldering of the tinned cases now so extensively employed in the preserved food trade. In common soft soldering the solder is melted and applied to the joint by a heated iron or copper soldering bolt, but solders are also applied by being melted on in the open fire, or in the muffle furnace, by immersing the joint in a bath of molten solder, or by pouring the molten material on the joint. In dealing with hard solders the heat of the blowpipe flame is used.

SOLE. Soles are a group of Flat-Fishes (*Pleuronectidæ*), which is represented by numerous species in all suitable localities within the temperate and tropical zones; they become, however, scarce in the southern parts of the southern temperate zone, and are absent altogether in some districts—for instance, on the coasts of southern Australia. Many of the species enter fresh water freely, and some have become thoroughly acclimatized in it. Soles are a highly specialized type of flat-fish; their mouth is very narrow, twisted round to the blind side, and small teeth are developed on that side only. As they always lie or swim on one side, the pectoral fins have ceased to have a function, and consequently these organs are reduced in size, and in many of the species are mere rudiments or are lost entirely. The eyes are small, invariably on the right side of the fish, the upper occupying a position more or less in advance of the lower. Soles are littoral fishes, inhabiting sandy bottoms, shifting with the season from shallow into somewhat deeper water. Like all flat-fishes they are carnivorous, but feed on small animals only; none attain to a large size, scarcely exceeding that of two feet. Of the forty species known of the genus *Solea*, four are found on the British coast; the one most generally known and commercially most important is the Common Sole (*Solea solea*). The Lemon Sole (*Solea aurantiaca*) is much less esteemed than the common sole, and more rarely seen in the market, probably because it is locally distributed in deeper water. It is of a yellow color, marbled with brown and irregularly spotted with black; the pectoral fin is ornamented with an ovate black spot on its hinder half.

SOLEURE, or SOLOTHURN, is one of the cantons of Switzerland, ranking as tenth in the Confederation, and taking its name from its chief town. As it consists simply of the territories won by the city, its irregular shape is easily accounted for. It takes in most of the valley of the Aar between the towns of Soleure and Olten, but stretches across the eastern Jura to Dornach not far from Basel, while to the south it tends in the direction of Bern. The total area is 305.9 square miles. The highest point in the canton is the Hasenmatte (4,754 feet), in the range behind the town of Soleure. In 1880 the population of the canton was 80,424, and it has increased little since then.

The only places of any size in the canton are its capital, Soleure (7,668 inhabitants), which possesses the finest armory in Switzerland, and Olten (3,979). It is counted as one of the most fertile and productive cantons in the Confederation, and exports iron, wood, marl, marble, glass, etc.

SOLI, an ancient town of Asia Minor, on the coast of Cilicia, between the rivers Lamus and Pyramus, from each of which it is about sixty-two miles distant. Colonists from Argos in Greece and Lindus in Rhodes are described as the founders of the town, which is first mentioned in history at the time of the expedition of the younger Cyrus. Extensive ruins still mark the site of the town; the place is now called Mezetlu.

SOLICITOR. (See ATTORNEY.) By the Supreme Court of Judicature Act, 1873, all persons admitted as solicitors, attorneys, or proctors of any English court, the jurisdiction of which was transferred by the Act to the High Court of Justice or the Court of Appeal, were thenceforth to be called solicitors of the supreme court. The title of attorney-general, however, still remains as that of the highest law officer of the crown.

In Scotland solicitors of the supreme court are not, as in England, the only persons entitled to act as law agents. They share the privilege with writers to the signet in the supreme court, with solicitors at law and procurators in the inferior courts. In the United States the term solicitor is used in some States in the sense which it bore in England before the Judicature Act, viz., a law agent practicing before a court of equity.

Many of the great public offices in England and the United States have their solicitors. In the United States the office of solicitor to the treasury was created by Act of Congress in 1830. His principal duties are to take measures for protecting the revenue and to deal with lands acquired by the United States by judicial process or vested in them by security for payment of debts.

SOLICITOR-GENERAL. See ATTORNEY-GENERAL.

The position of the solicitor-general for Scotland in the main corresponds with that of the English solicitor-general. He is next in rank to the lord-advocate. In the United States the office of solicitor-general of the United States was created by Act of Congress in 1870.

SOLIMAN, or SULEIMAN, sultan of the Ottomans, surnamed The Magnificent, born about 1490, was the only son of Selim I., whom he succeeded in 1520. He died while he was besieging Sziget in Hungary, on September 5, 1566. (See TURKEY.)

SOLIMAN, or SULEIMAN, shah of Persia. (See PERSIA.)

SOLINGEN, a Prussian town, in the province of the Rhine, stands on a height near the Wupper, thirteen miles east-by-south of Düsseldorf. It is one of the chief seats of the German iron and steel industry, its specialty consisting in all kinds of cutting implements of steel. Solingen sword-blades have been celebrated for centuries. The population of the town is 18,643, of whom three-fourths are Protestants.

SOLIS, ANTONIO DE, Spanish dramatist and historian, was born in 1610 at Alcalá de Henares, and studied law at Salamanca, where he is said to have produced a comedy which was acted in 1627. About 1640 he became secretary to the duke of Oropesa, whom he accompanied in various official missions; in 1654 he became one of the secretaries of Philip IV., and afterward he was appointed chronicler. In his later years he joined one of the religious orders. He died at Madrid in 1686.

SOLOMON (Hebrew, שְׁלֹמֹה, *Shĕlōmō* for Shĕlōmōn, "man of peace;" the English form follows the *Σολόμων* of N. T. and Josephus; the Latin *Salomo* agrees with *Σολώμων*, one of several variant forms shown in MSS. of the LXX.), son of David by Bathsheba, and his successor in the kingdom of Israel. The reign of Solomon has been sketched in ISRAEL, and his relation to the philosophical and proverbial literature of the Hebrews, the so-called *chokma*, or "wisdom," has been critically considered in the article PROVERBS. The political system of Solomon fell to pieces at his death, but the fame of his wisdom and splendor in succeeding generations was all the greater that none of his successors at Jerusalem was in a position to rival him. The many floating and fragmentary notes of various dates that have found a place in the account of his reign in the book of KINGS (*q.v.*) show how much Hebrew tradition was occupied with the monarch under whom the throne of Israel reached its highest glory; and that time only magnified in popular imagination the proportions of so striking a figure appears alike in the unfriendly picture of Solomon in the Song of Solomon (originally, it would seem, sketched in the Northern kingdom, however much it may have been retouched and overlaid by additions of later date --see CANTICLES) and in the monologue of ECCLESIASTES (*q.v.*) placed in the mouth of the wise king who had tasted all that life can offer by one of the latest writers of the Old Testament. In the apocryphal book of Wisdom, again, the composition of an Egyptian Hellenist, who from internal evidence is judged to have lived somewhat earlier than Philo, Solomon is introduced uttering words of admonition, imbued with the spirit of Greek philosophers, to heathen sovereigns. Solomon was supposed to owe his sovereignty over demons to the possession of a seal on which the "most great name of God" was engraved. (See Lane, *Arabian Nights*.)

SOLOMON, SONG OF. See CANTICLES.

SOLOMON, WISDOM OF. See APOCRYPHA.

SOLOMON ISLANDS, an extensive group of islands, the largest and as yet least known of any in the Pacific Ocean, though among the very first that were discovered. They form a double chain of seven large and many small islands, extending for over 600 miles in a northwest and southeast direction between 5° S. latitude, 154° 40′ E. longitude, and 10° 54′ S. latitude, 162° 30′ E. longitude. The northern extremity stretches to within 120 miles of New Ireland, the southeastern point to 200 miles west of Santa Cruz, and the nearest portion of New Guinea lies about 400 miles to the southwest of the group.

The Solomon Islands vary considerably both in size and character. It is as yet doubtful which of them is the largest, but seven are from 50 to over 100 miles in length and from 15 to 30 miles in breadth. They are well watered, though the streams seem to be small; their coasts afford some good harbors. All the large and some of the smaller islands appear to be composed of ancient volcanic rock, with an incrustation of coral limestone showing here and there along the coast. Their interior is mountainous, and Guadalcanal, where there is an active volcano, reaches an altitude of 8,000 feet.

The climate is very damp and debilitating. The rainfall is unusually heavy. Fever and ague prevail on the coast, but it is likely that the highlands are much more healthy. The dry season, with northwest winds, lasts from December to May. A comparatively shoal sea—under 1,000 fathoms—surrounds the Archipelago, and, including the New Britain and Admiralty Islands, stretches to New Guinea and thence to Australia. This sufficiently accounts for the Papuan character of its fauna, of which, however, it is the eastern limit, in spite of the fact that this shoal water extends to the extreme south of the New Hebrides.

The Solomon Islanders, excepting those of Bellona and Rennell in the south, and Ongtong Java in the north—who are pure Polynesians—are a small, sturdy Melanesian race, taller in the north than in the south, but averaging about five feet four inches for men, and four feet nine inches for women. They are well proportioned, with nicely rounded limbs. Projecting brows, deeply-sunk dark eyes, short noses, either straight or arched, but always depressed at the root, and moderately thick lips, with a somewhat receding chin, are general characteristics. Of their religion and manners and customs very little is known. Their language is of pure Melanesian type, though a number of dialects are spoken throughout the group—many even on the same island. Broken into numerous clans, they are rarely at peace with each other; but the attention bestowed on plantations proves them good agriculturists. Yams, arum-roots, bread-fruit, cocoa-nuts, and fish constitute the chief of their food. Pigs, dogs, and fowls are also eaten, and, as these are mentioned by Mendaña, they must have been known in the islands for over 300 years. The islanders are great betel-chewers, but little palm arrack or kava seems to be drunk. The respect paid to chiefs and elders varies in different islands. They are cannibals, though to what extent is unknown. Trophies of human skulls are common, and preserved heads—the face inlaid with shell—have been procured in Guadalcanal and Rubiana. They are said to pay honor to departed spirits.

The Spanish navigator Mendaña must be credited with the discovery of these islands, though it is somewhat doubtful whether he was actually the first European who set eyes on them. He sailed from Callao in 1567, by command of the governor of Peru, to discover the southern continent, the presumed existence of which in the then unknown region between America and Asia had already given rise to much speculation; but he seems to have been strangely unfortunate. Sailing west he discovered only a few coral islets (Ellice group?) until, having crossed more than 7,000 miles of ocean, he fell in with an archipelago of large islands. By their size and position he considered them to form part of the land he was in search of, and in pleasing anticipation of their natural riches he named them Islas de Salomon. The expedition surveyed the southern portion of the group, and named the three large islands San Cristoval, Guadalcanal, and Ysabel. On his return to Peru Mendaña endeavored to organize another expedition to colonize the islands, but it was not before June, 1595, that he, with Quiros as second in command, was enabled to set sail for this purpose. The Marquesas and Santa Cruz Islands were now discovered; but on these latter islands, after various delays and troubles, Mendaña died, and the expedition eventually collapsed.

SOLON. The legislation of the Athenian Solon, which to a large extent molded the subsequent political life of Athens, belongs to the early part of the sixth century B.C. It followed almost immediately on an unsuccessful attempt to overthrow the government of the aristocratic families of Attica, one of which, however, that of the Alcmæonids, was driven into exile; and it preceded by a short interval the famous usurpation of Pisistratus. Solon had won the confidence of his fellow-citizens by having recovered for them the island of Salamis, close to the shores of Attica, an old and valued possession, which their neighbors of Megara had taken from them. Solon, himself a native of Salamis, encouraged them to fight once again for the "lovely island," as he called it, in a short poem which he publicly recited, feigning, it is said, the excitement of a madman. Through Spartan intervention in the war between Athens and Megara Salamis was restored to the Athenians, and Solon had the credit of the result. In 594 B.C. he was summoned under the constitutional title of "archon" to undertake the work of sweeping political reforms, which, in consequence of bitter party strifes and the poverty and indebtedness of the small farmers or proprietors of Attica, were sorely needed. His first step was to give immediate relief to the poor debtor, to the wretchedly impoverished small farmer or proprietor, and to interpose between him and his creditor and landlord. The reconstruction of the political system on the principle that every citizen was to have a share in the government was Solon's next work. Solon made property the measure of political power, and confined the higher offices of state to the wealthier citizens; but election to these offices was to be made by the whole body of the people, the tenure of office was limited as to time, and an account had to be rendered publicly as to its exercise.

Solon encouraged commerce and manufacturing industry, and drew a number of settlers from foreign parts to Athens, on condition of their paying an annual tax and putting themselves under the protection of a citizen who was to be their legal representative—their "patronus," according to Roman phrase. These settlers (*μετοίκοι*, "metics") had none of the political privileges of the Athenian citizen, and they could not acquire landed property. Many of them, however, flourished and grew rich, and had every reason to be satisfied with their position, which, in a kindly and tolerant community like that of Athens, was continually improving. Solon, too, like all the legislators of antiquity, endeavored to regulate every department of life, compelling the attendance of the youths from sixteen to eighteen at the public gymnastic schools, and requiring them to serve the next two years on garrison duty. Restraints were put upon women as to their appearance in public, and even as to their mourning at funerals. Solon's punishments were for the most part rather lenient, and indicated a humane and generous temper. It is of course not to be supposed that all the details of his legislation were maintained, but they undoubtedly left their mark on the Athenian character.

Having done his work, Solon left Athens and traveled for ten years in Egypt, Cyprus, and Asia, gathering fresh stores of knowledge for himself and giving counsel to others. On his return to Athens in his old age he found the old feuds once more raging, and Pisistratus, his kinsman, and his friend in past days, intriguing for power. The two men had, it seems, a sincere respect for one another, but Solon protested against the complete surrender of the government to Pisistratus, the danger of which he publicly pointed out, though without effect. The crisis ended in the rule, in many respects an enlightened and beneficent rule, of Pisistratus and his sons, of which Solon lived only to see the first beginning. He died, soon after having made his honorable protest, at the age of eighty, leaving behind him the good effects of a work which only a man of rare intelligence and wide sympathies could have accomplished. He was something of a poet, and several fragments of his poems, written generally with a practical purpose, have come down to us, and throw light on his political aims and sentiments.

SOLOTHURN. See SOLEURE.

SOMÂLI, SOMÂL, a Hamitic people of east Central Africa, mainly confined to the eastern "horn" of the continent, which from them takes the name of Somâli Land, probably the Punt of the Egyptian records. Here they are conterminous toward the northwest with the kindred Afars (Dankali), and elsewhere with the more closely related Gallas, from whom they are separated on the southwest by the river Juba. Tajurra Bay, with the lower course of the Hawash, is usually given as the northwest frontier; but, according to the recent explorations of Abargues de Sostén in eastern Abyssinia, there appears to be here an overlapping of the three peoples, the Isa Somâli encroaching on the Afar domain of north Tajurra Bay nearly to the parallel of Asab Bay (13° north), while the Dawari Gallas penetrate between this Somâli tribe and the lower Hawash eastward to the coast at Obok (12° north). A line drawn from the Strait of Bab-el-Mandeb through the Harrar district and the headwaters of the Haines river Webbe-Shebeyli or "Leopard river") southward to the equator at the mouth of the Juba will roughly define the landward frontier of the Somâli territory, which is elsewhere sea-girt—by the Gulf of Aden on the north, by the Indian Ocean from Cape Guardafui to the equator.

SOMERS, JOHN, was born on March 4, 1652, at Worcester. After being at school at Worcester he was entered as a gentleman commoner at Trinity College, Oxford, and afterward studied law under Sir Francis Winnington, who became solicitor-general, and joined the Middle Temple. He appears, in addition to his legal studies, to have written several poems and pamphlets. He soon became intimate with the leaders of the country party, especially with Essex, Russell, and Algernon Sidney, but never entered into their plans so far as to commit himself beyond recall. He was the author of the *History of the Succession of the Crown of England, collected out of Records, etc.*, and was reputed to have written the *Just and Modest Vindication of the Two Last Parliaments*, which was put forward as the answer to Charles II.'s famous declaration of his reasons for dissolving them. In the secret councils of those who were planning the revolution Somers took a leading part, and in the Convention Parliament was elected a member for his native town. He was immediately appointed one of the managers for the Commons in the conferences between the Houses, and in arguing the questions whether James II. had left the throne vacant by abdication and whether the Acts of the Convention Parliament were legal—that parliament having been summoned without the usual writs—he displayed great learning and legal subtlety. He was further distinguished by being made chairman of the committee which drew up the celebrated Declaration of Right. On May 9, 1689, Somers was made solicitor-general. He now became William III.'s most confidential adviser. In the controversy which arose between the Houses on the question of the legality of the decision of the Court of King's bench regarding Titus Oates, and of the action of the Lords in sustaining this decision, Somers was again the leading manager for the Commons. He was appointed attorney-general, and in that capacity strongly opposed the bill for the regulation of trials in cases of high treason. On March 23, 1693, the great seal having meanwhile been in commission, Somers was appointed lord-keeper, with a pension of $10,000 a year from the day on which he should quit his office, and at the same time was made a privy councilor. He had previously been knighted. Somers now became the most prominent member of the Junto, the small council which comprised the chief members of the Whig party. When William left in May, 1695, to take command of the army in the Netherlands, Somers was made one of the seven lords-justices to whom the administration of the kingdom during his absence was intrusted; and he was instrumental in bringing about a reconciliation between William and the Princess Anne.

In April, 1697, Somers was made lord chancellor, and was created a peer by the title of Baron Somers of Evesham. When the discussion arose on the question of disbanding the army, he summed up the case against disbanding, in answer to Trenchard, in a remarkable pamphlet called *The Balancing Letter.* Hitherto Somers' character had kept him free from attack at the hands of political opponents; but his connection in 1699 with the notorious Kidd, who, being sent out to put down the pirates in the Indian Ocean, turned pirate himself, and to the defraying of whose expedition Somers had given $5,000, afforded an opportunity; the vote of censure, however, proposed upon him in the House of Commons for giving Kidd a commission under the great seal was rejected by 199 to 131. In consequence, however, of the incessant agitation, William now requested Somers to resign; this he refused to do, but gave up the seals to William's messenger. In 1701 he was impeached by the Commons on account of the part he had taken in the negotiations relating to the Partition Treaty in 1698, and defended himself most ably before the House, answering the charges *seriatim*. The impeachment was voted and sent up to the Lords, but was there dismissed. He was made president of the council in 1708 upon the return of the Whigs to power, and retained the office until their downfall in 1710. From this time his powers of mind rapidly declined, and after being almost imbecile for six years he died of apoplexy on April 26, 1716.

SOMERSET, a maritime county in the southwest of England, bounded east by Wiltshire, southeast by Dorset, southwest and west by Devonshire, northwest by the Bristol Channel, and north by Gloucestershire. The total area of land and water is 1,049,815 acres or 1,640 square miles. The two principal rivers are the Lower Avon and the Parret. The Avon, after forming for a short distance the boundary with Wilts, crosses the northeastern corner of the county, encircling Bath, and forms the boundary with Gloucestershire till it reaches the sea six miles beyond Bristol. It is navigable for barges as far as Bath. The Parret from South Perrott in Dorset, on the borders of Somerset, crosses the center of the county northwestward by Bridgwater, receiving the Ivel or Yeo and Cary on the right, and the Isle and Tone on the left. Among other streams are the Axe, which rises at Wookey Hole in the Mendips and flows northwestward along their base to the Bristol Channel near Blackrock; the Brue, which rises to the east of Bruton, near the borders of Wiltshire, and enters the Bristol Channel near the mouth of the Parret; and the Exe (with its tributary the Barle), which rises in Exmoor forest and passes southward into Devon.

The diversified surface of the county is accounted for by the variety and complexity of its geological structure. Though the exposed area of the coalfield of Somerset is only about fourteen square miles, it is estimated to extend over 238 square miles. Next to coal the most important mineral production is freestone from the Oolitic strata, the largest quarries being in the neighborhood of Bath. Copper and manganese are obtained in small quantities, as well as fuller's earth, marl, cement from the Lias, and ocher.

The county is so completely intersected by branches of the Great Western railway in the north and west, and of the South Western in the south and east, that there is perhaps no hamlet more than seven miles from a railway station.

Woolen and worsted goods are manufactured in a large number of towns; silk at Frome, Taunton, and Shepton Mallet; gloves at Yeovil, Taunton, and other places; crape at Dulverton and Shepton Mallet. There are large potteries at Bridgwater and Weston-super-Mare; at the former town and at Bath there are extensive carriage-works; and there are paper-mills on several of the streams. Most of the commerce of the county passes through Bristol, which is situated mainly in Gloucestershire.

In the hilly districts much of the land is uncultivated and barren, although affording some pasturage for sheep. There are large tracts of rich meadow land along the banks of the rivers, and the vale of Taunton is well adapted for wheat. Out of a total area of 1,049,815 acres there were 867,469 acres in 1885 under culture, of which 625,957 acres, or nearly three-fourths, were in permanent pasture, 5,8863 under clover and rotation grasses, 115,005 under corn crops, 61,650 green crops, 560 flax, and 5,434 fallow.

Somerset comprises forty hundreds, two liberties (Hampton and Claverton, Mells and Leigh), the cities of Bath (population 51,814 in 1881) and Wells (4,634), part (38,131) of the city of Bristol, and the municipal boroughs of Bridgwater (12,007), Chard (2,411), Glastonbury (3,719), Taunton (16,614), and Yeovil (8,479). For parliamentary purposes the county, which was formerly divided into East, Mid, and West Somerset, was by the Act of 1885 parted out in seven separate divisions —North, South, East, West (or Wellington), Bridgwater, Frome, and Wells. The city of Bath returns two members, and a portion of the East Division of Bristol is within the limits of the county. From 273,577 in 1801 the population had increased in 1831 to 403,795, in 1851 to 443,916, in 1871 to 463,483; and in 1881 to 469,109. It is now (1890) about 500,000.

SOMERSET, Edward Seymour, Duke of, born in 1500, eldest brother of Jane Seymour, Henry VIII.'s third wife, was created earl of Hertford in 1537, on the birth of his nephew, afterward Edward VI. In 1544 he commanded in the war with Scotland, and sacked Edinburgh. Next year he again commanded against the Scots; and he was employed by Henry in many important negotiations throughout the latter part of his reign. On the accession of Edward VI. he was made protector by the council, and was soon afterward created duke of Somerset. He at once made use of his power to encourage the extreme Reformers, and a general destruction of ecclesiastical works of art was the result. In September, 1547, finding the Scots unwilling to listen to his proposals for a marriage between Edward and Mary Stuart, he marched an army into Scotland and won the battle of Pinkie Cleugh. War with France followed, and the result was the loss of Boulogne. Equally disastrous was the protector's domestic policy. He was animated by a dislike of arbitrary government, and by a desire to improve the condition of the poor, but was at the same time a slave to his own ambition. He pushed on the Protestant Reformation with inconsiderate speed, repealed the Treason Acts of Henry VIII.'s reign, and issued a commission to inquire into agricultural distress. The agitation into which these measures threw the country produced insurrections in the west and east, which were with some difficulty suppressed. Irritated by his arrogance, rashness, and incapacity, the council, in October, 1549, turned against him, deprived him of the protectorate, and confined him in the Tower. Released in 1550, he recovered much of his influence through the misgovernment of his successors, and contemplated a return to power at their expense. His plans being discovered, he was tried on a charge of felony, and executed on January 22, 1552.

SOMERSET, Robert Carr, Earl of, came of a good Scottish family, the Kers of Ferniehurst. The date of his birth seems uncertain, but he was a lad when James I. ascended the English throne. When this event occurred Carr gave up the position which he had hitherto occupied as page at the Scottish court, and sought for a time to make his fortune in France. Returning to England he entered the service of Lord Hay, and soon attracted the attention of the king. Entirely devoid of all higher qualities, Carr was endowed with good looks, excellent spirits, and considerable personal accomplishments. These advantages were sufficient for James, who knighted the young man and at once took him into favor. His influence was such that in 1610 he persuaded the king to dissolve the parliament, which had shown signs of attacking the Scottish favorites. Next year Carr was made an English peer, and took his seat in the House of Lords as Viscount Rochester. Shortly afterward he became a privy councilor, and in the autumn of 1613 he was created earl of Somerset. In 1614 he became lord chamberlain.

He was now at the zenith of his power, but the event had already occurred which was to prove his ruin. Before 1609, while still only Sir Robert Carr, he had commenced an intrigue with Lady Essex. In 1613 that lady set about procuring a divorce from her husband, with the object of afterward marrying Carr. James favored the cause of Lady Essex; the court pronounced a decree of divorce; and in December, 1613, she married the earl of Somerset. Ten days before the court gave judgment, Sir Thomas Overbury, who apparently knew facts concerning Lady Essex which would have been fatal to her success, was poisoned in the Tower. No idea seems to have been entertained at the time that Lady Essex and her future husband were implicated. For two years more Somerset continued to exercise a paramount influence over James, and it was not till 1615 that his arrogant behavior began to alienate the king. His fall was due, however, not to the loss of the king's favor nor to the combination at court against him, but to the discovery of the circumstances of Overbury's death. In July, 1615, Somerset obtained a full pardon from the king for all offenses which he might have committed. Soon afterward the truth about the murder came out. Coke and Bacon were set to unravel the plot. After four of the principal agents had been convicted and punished, the earl and countess were brought to trial. The latter confessed, and of her guilt there can be no doubt. Somerset's share is far more difficult to discover, and probably will never be fully known. The evidence against him rested on mere presumption, and he consistently declared himself innocent. Probabilities are on the whole in favor of the hypothesis that he was not more than an accessory after the fact. James let matters take their course, and both earl and countess were found guilty. The sentence was not carried into effect against either culprit. The countess was pardoned immediately. The earl appears to have refused to buy forgiveness by concessions, and it was not till 1624 that he obtained his pardon. Thenceforward he disappears from public view. He died, without heirs, in 1645.

SOMERVILLE, previous to its incorporation with Boston a city of Middlesex county, Mass., lying on Mystic river, two miles northwest of the Boston statehouse. It was named in honor of Richard Somers, a naval officer, and was incorporated as a city in 1872. The population is 40,152. Glass-works, bottle-works, flour-mills, a bleachery, and a brass-tubing factory are among the industrial establishments.

SOMERVILLE, MARY, scientific writer, was the daughter of Admiral Sir William George Fairfax, and was born December 26, 1780. She received a rather desultory education, and mastered algebra and Euclid in secret after she had left school, and without any extraneous help. In 1804 she married her cousin, Capt. Samuel Greig, who died in 1806; and in 1812 she married another cousin, Dr. William Somerville, inspector of the army medical board, who encouraged and greatly aided her in the study of the physical sciences. After her marriage she made the acquaintance on the Continent and in London of the most eminent scientific men of the time, among whom her talents had attracted attention before she had acquired general fame, Laplace paying her the compliment of stating that she was the only woman who understood his works. Having been requested by Lord Brougham to translate for the Society for the Diffusion of Useful Knowledge the *Mécanique Céleste* of Laplace, she greatly popularized its form, and its publication in 1831 under the title of *The Mechanism of the Heavens* at once made her famous. She was elected an honorary member of the Royal Astronomical Society, and her bust by Chantrey was placed in the hall of the Royal Society of London. Her other works are the *Connection of the Physical Sciences* (1834), *Physical Geography* (1848), and *Molecular and Microscopic Science* (1869). Much of the popularity of her writings is due to their clear and crisp style, and the underlying enthusiasm for her subject which pervades them. In 1835 she received a pension of $1,500 from government. She died at Naples, November 28, 1872.

SOMME, a department of northern France, formed in 1790 of a large part of the province of Picardy (comprising Vermandois, Santerre, Amiénois, Ponthieu, Vimeu, and Marquenterre) and a small portion of Artois. It is bounded on the north by Pas-de-Calais and Nord, east by Aisne, south by Oise, and southwest by Seine-Inférieure, and its sea-coast extends twenty-eight miles along the English Channel. Two streams flowing into the channel—the Authie on the north and the Bresle on the southwest—bound it in these directions. The surface consists of great rolling plains, generally well-cultivated and very fertile. The highest point, hardly 700 feet above the sea, lies in the southwest, not far from Aumale. From the mouth of the Authie to the Bay of the Somme the coast is lined with a belt of sand-dunes about two miles broad, behind which is the Marquenterre, a tract of 50,000 acres reclaimed from the sea by means of dykes and traversed by drainage canals. The river Somme traverses the department from southeast to northwest for a distance of 125 miles, through a marshy valley abounding in peat. Commanded by Ham, Péronne, Amiens, and Abbeville, this valley forms a northern line of defense for Paris. Apart from the water-power it supplies, the Somme is of great commercial value, being accompanied by a canal all the way from its source wherever it is not itself navigable. The most important affluents of the Somme—the Ancre from the northeast by way of Albert and Corbie, the Avre from the southeast by Roye, and the Selle from the south by Conty—join the main stream at Amiens. The Authie and the Bresle are respectively sixty-five and forty-five miles long. The mean temperature is lower than that of Paris (49° Fahr. at Abbeville). Rain falls on 175 days per annum (thirty-three inches at Abbeville).

Of the total area of 1,522,520 acres, 1,178,184 acres are under tillage, 68,844 are under meadows and pasture land, 133,837 are occupied by wood, while 30,514 acres are heaths or uncultivated tracts. In 1881 the live stock included 78,069 horses, 940 mules, 6,125 asses, 140,512 cattle, 449,675 sheep (wool-clip 1,117 tons), 82,755 pigs, 21,726 goats. The department, especially in the northeast, is one of the best cultivated in France. Beetroot for sugar is the staple crop of the Péronne arrondissement; cereals, fodder, oil plants (especially the poppy), hemp and potatoes are grown throughout the department, the latter more largely on the seaboard. No wine is made but the cider harvest of 1883 amounted to 8,904,100 gallons, and beer is a common beverage. Cotton is spun by 72,800 spindles and woven by 745 power-looms and 5,000 hand-looms. Moleskins and velvets for upholstery and other purposes are among the articles manufactured. Wool is wrought in 44 establishments with 124,000 spindles, 120 power-looms, and 400 hand-looms, producing yarns of all kinds. Tulles, embroidery, laces, ribbons, plush, carpets, cotton and woolen hose are also manufactured. The last industry employs half the population of Santerre. About 6,400 workmen are engaged in the iron and copper industries, steam-engine and boiler making, and the production of spinning-mill machinery, railway plant, and umbrella frames. The arrondissement of Abbeville is the center of a great lock-manufacture, employing from 4,000 to 5,000 workmen. There are also chemical factories, bleacheries, tanneries, paper-mills, saw-mills, and soap and candle works. Beetroot sugar is manufactured in 66 establishments (5,090 horse-power and 6,450 workmen). The population is 550,837. The department constitutes the diocese of Amiens, which city (population 67,874) is also the seat of a court of appeal and the headquarters of the second corps d'armée, in which the department is included.

SOMMERFELD, an industrial town of Prussia, in the province of Brandenburg, lies on the Lubis, forty miles to the southeast of Frankfort-on-the-Oder. Its manufactures of woolen cloth are important—the annual value of the goods produced being upward of half a million sterling; and it also contains finishing and dye works, an iron foundry, boiler-works, etc. The population is 11,364, almost all Protestants.

SOMNAMBULISM. See SLEEP.

SOMNÁTH, an ancient but decayed city of peninsular Guzerat, India, with a population of 6,644, mostly Mohammedans, is situated on a bay of the Arabian Sea, in 20° 53′ N. latitude and 70° 24′ E. longitude. The port, which is called Verâwal, is distinct from the city proper (Deva-Pattan, Somnáth-Pattan, or Prabhas).

SONDERSHAUSEN. See SCHWARZBURG-SONDERSHAUSEN.

SONNET (Ital. *Sonetto*, dim. of *Suono*, Fr. *Sonnet*). The sonnet in the literature of modern Europe is a brief poetic form of fourteen rhymed verses, ranged according to prescription. It does not, however, belong to what has been called, properly perhaps, under RONDEAU (*q.v.*), the poetry of ingenuity. Although in a language like the English it does no doubt require considerable ingenuity to construct a satisfactory sonnet of octave and sestet running upon four rhymes, this ingenuity is only a means to an end, the end being properly that a single wave of emotion, when emotion is either too deeply charged with thought, or too much adulterated with fancy, to pass spontaneously into the movements of pure lyric, shall be embodied in a single metrical flow and return.

In modern Europe the sonnet has always had a peculiar fascination for poets of the first class—poets, that is, in whom what we have called poetic energy (see POETRY) and plastic power are equally combined. It would seem that the very fact that the sonnet is a recognized structure suggestive of mere art—suggestive in some measure, indeed, of what Schiller would call "sport" in art—has drawn some of the most passionate poets in the world to the sonnet as the medium of their sincerest utterances. Without being coldly artificial, like the rondeau, the sestina, the *ballade*, the *villanelle*, etc., the sonnet is yet so artistic in structure, its form is so universally known, recognized, and adopted as being artistic, that the too fervid spontaneity and reality of the poet's emotion may be in a certain degree veiled, and the poet can whisper, as from behind a mask, those deepest secrets of the heart which could otherwise only find expression in purely dramatic forms.

That the sonnet was invented, not in Provence, as French critics pretend, but in Italy in the thirteenth century, is pretty clear, but by whom is still perhaps an open question.

As regards English sonnets, whether the Petrarchian and the Shakespearean are really the best of all possible forms we need not inquire. But, inasmuch as they have become so vital and so dominant over other sonnet forms that whenever we begin to read the first verse of an English sonnet we expect to find one or other of these recognized rhyme arrangements, any departure from these two arrangements, even though the result be such a magnificent poem as Shelley's *Ozymandias*, disappoints the expectation, baffles the ear, and brings with it that sense of the fragmentary and the inchoate to which we have before alluded. If, however, some writer should arise with sufficient originality of metrical endowment and sufficient poetic power to do what Keats, in a famous experiment of his tried to do and failed—impress the public ear with a new sonnet structure, impress the public ear so powerfully that a new kind of expectance is created the moment the first verse of a sonnet is recited—then there will be three kinds of English sonnets instead of two.

SOPHIA DOROTHEA, the daughter and heiress of Duke George William of Brunswick-Lüneburg-Celle, was born on September 15, 1666. On November 21, 1682, she was married to Prince George Louis of Hanover, afterward George I. of England, to whom she bore, in 1683, a son, afterward King George II., and, in 1687, a daughter, Sophia Dorothea, afterward the wife of Frederick William I. of Prussia and the mother of Frederick the Great. For her illicit relations with Count Philip Christopher von Königsmark Sophia Dorothea was divorced from her husband, the elector, in December, 1694, and the remainder of her life was spent in a dignified captivity under a military guard at her ancestral seat of Ahlden. She died on November 13, 1726.

SOPHISTS. Sophist, or "man of wisdom," was the name given by the Greeks about the middle of the fifth century B.C. to certain teachers of a superior grade who, distinguishing themselves from philosophers on the one hand and from artists and craftsmen on the other, claimed to prepare their pupils, not for any particular study or profession, but for civic life. For nearly a hundred years the sophists held almost a monopoly of general or liberal education. Yet, within the limits of the profession, there was considerable diversity both of theory and of practice. Four principal varieties are distinguishable, and may be described as the sophistries of culture, of rhetoric, of politics, and of eristic or disputation. Each of these predominated in its turn, though not to the exclusion of others, the sophistry of culture beginning about 447, and leading to the sophistry of eristic, and the sophistry of rhetoric taking root in central Greece about 427, and merging in the sophistry of politics. Further, since Socrates and the Socratics were educators, they too might be, and in general were, regarded as sophists; but, as they conceived truth—so far as truth was attainable—rather than success in life, in the law court, in the assembly, or in debate, to be the right end of intellectual effort, they were at variance with their rivals, and are commonly ranked by historians, not with the sophists, who confessedly despaired of knowledge, but with the philosophers, who, however unavailingly, continued to seek it. With the establishment of the great philosophical schools—first, of the Academy, next of the Lyceum—the philosophers took the place of the sophists as the educators of Greece.

The sophistical movement was then primarily an attempt to provide a general or liberal education which should supplement the customary instruction in reading, writing, gymnastic, and music. But, as the sophists of the first period chose for their instruments grammar, style, literature, and oratory, while those of the second and third developments were professed rhetoricians, sophistry exercised an important influence upon literature. Then again, as the movement, taking its rise in the philosophical agnosticism which grew out of the early physical systems, was itself persistently skeptical, sophistry may be regarded as an interlude in the history of philosophy. Finally, the practice of rhetoric and eristic, which presently became prominent in sophistical teaching, had, or at any rate seemed to have, a mischievous effect upon conduct; and the charge of seeking, whether in exposition or in debate, not truth but victory—which charge was impressively urged against the sophists by Plato—grew into an accusation of holding and teaching immoral and unsocial doctrines, and in our own day has been the subject of eager controversy.

SOPHOCLES, the most perfect, and next to Æschylus the greatest, of Greek tragic poets, was born 495 B.C. and died 406 B.C. As in the case of other Athenian celebrities, various particulars of his life are handed down, few of which, however, deserve much attention, even the reports attributed to contemporaries being mostly trivial if not puerile. He is known to have reached old age, and his career as a dramatist is believed to have extended over more than sixty years (468–406). Apart from tragic victories, the event of Sophocles' life most fully authenticated is his appointment at the age of fifty-five as one of the generals who served with Pericles in the Samian War (440–439 B.C). His minor poems, elegies, pæans, etc., have all perished; and of his hundred and odd dramas only seven remain. These all belong to the period of his maturity (he had no decline); and not only the titles (as Lessing said) but some scanty fragments of more than ninety others have been preserved. Several of these were, of course, satiric dramas. And this recalls a point of some importance, which has been urged on the authority of Suidas, who says that "Sophocles began the practice of pitting play against play, instead of the tetralogy." If it were meant that Sophocles did not exhibit tetralogies, this statement would have simply to be rejected.

If the diction of Sophocles sometimes reminds his readers of the *Odyssey*, the subjects of his plays were more frequently chosen from those later epics which subsequently came to be embodied in the epic cycle—such as the *Æthiopis*, the *Little Iliad*, the *Iliupersis*, the *Cypria*, the *Nosti*, the *Telegonia* (all revolving round the tale of Troy), the *Thebaica*, the Οἰχαλίας αλωσις, and others, including probably, though there is no mention of such a thing, some early version of the Argonautic story. In one or other of these heroic poems the legends of all the great cities of Hellas were by this time embodied. As Sophocles has been accused of narrowing the range of tragic sympathy from Hellas to Athens, it deserves mention here that, of some hundred subjects of plays attributed to him, fifteen only are connected with Attica, while exactly the same number belong to the tale of Argos, twelve are Argonautic, and thirty Trojan. Even Corinthian heroes (Bellerophon, Polyidus) are not left out. It seems probable on the whole that, within the limits allowed by convention, Sophocles was guided simply by his instinctive perception of the tragic capabilities of a particular fable.

SOPHRON of Syracuse, next to Epicharmus the greatest representative of Sicilian comedy, flourished about 430 B.C. He was the author of mimes, written in prose, containing both male and female characters—Μῖμοι ἀνδρεῖοι and Μῖμοι γυναικεῖοι—and depicting scenes from the daily life of the Sicilian Greeks. From the extremely scanty fragments which remain of his writings we can only see that he used the local dialect, frequently sacrificing refinement to vigor; he sometimes reminds us of Plautus in his employment of bold and expressive figures and turns of expression.

SOPRON. See OEDENBURG.

SORA, a city of Italy, at the head of a circondario in the province of Caserta (Terra di Lavoro), is built in a plain on the banks of the Garigliano and on the highway from Rome *via* Tivoli and Avezzano to Naples. It is the seat of important manufactures—wool-spinning, cloth-weaving, and paper-making—this last industry dating from the time of Murat. The original cathedral consecrated by Pope Adrian IV. in 1155, was destroyed by the earthquake of 1634. The population of the city is about 6,000.

SORAU, an industrial town and railway junction in the south of Brandenburg, Prussia, is situated fifty-four miles to the southeast of Frankfort-on-the-Oder, and not far from the Silesian border. Sorau contains a number of ancient buildings, among which the most prominent are several of the churches (one dating from 1204), the town-house, built in 1260, and the old palace of 1207. The new palace was erected in 1711. The varied manufactures of the town comprise cloth, linen, wax candles, starch, bone-meal, etc. The population is 13,668, upward of 12,000 of them being Lutherans.

SORBONNE, the name formerly borne by the old faculty of theology in Paris, and now applied to the seat of the *académie* of that city and of the three faculties of theology, science, and literature. (See FRANCE and UNIVERSITIES.) The Sorbonne owes its origin and its name to Robert de Sorbon, a poor priest of Champagne, who, arriving in Paris about the beginning of the reign of St. Louis, attained high repute by his sanctity and eloquence, and was appointed by the king to be his chaplain. Assisted by royal liberality, he built upon Mont Sainte-Geneviève a modest establishment in which were accommodated seven priests charged with the duty of teaching theology gratuitously; to this he added a college of preparatory studies, all under the direction of a provisor, under whom was an annual prior, who had the actual management. The new institution was authorized by letters patent of 1255, and canonically sanctioned by Pope Alexander IV. in 1259. Destined originally for poor students, the Sorbonne soon became a meeting-place for all the students of the university of Paris.

When the university of France was organized in 1808 the Sorbonne became the seat of the *académie* of Paris; and between 1816 and 1821 the faculties of theology, science, and literature were installed there with their libraries. All the great university functions are held within its great amphitheater. Since 1861 there has annually been held in the Sorbonne at Easter an official congress in which are represented the learned societies of the departments; there are five sections—those of archeology, history, the moral and political sciences, the physical sciences, geography—which hold separate sittings. The fine arts form a sixth section, with a special organization.

A reconstruction of the buildings of the Sorbonne, projected by Napoleon III., was begun in 1884, under the architectural direction of Nénot. The old church containing the tomb of Richelieu was retained on account of its artistic merit. The building was completed in 1889.

SOREL, a town in the province of Quebec, Canada, is located at the junction of the Richelieu and St. Lawrence rivers, forty-five miles northeast of Montreal. It is also the terminus of a branch of the Southwestern road, the Montreal and Sorel division of the Grand Trunk, and of the Yamaska and Nicolet roads. Shipbuilding is a specialty of the inhabitants, and the town is the winter quarters for steamers and other craft plying the St. Lawrence during the summer season. A number of dry-docks have been constructed, and exceptional facilities are available for the purpose indi cated. Manufacturing is also extensively engaged in, particular attention being paid to the construction of engines and boilers, mill machinery, etc., and the production of stoves and hardware, lumber, flour, leather, and other commodities of a standard character. The place contains five weekly papers, three of which are published in the French language, three banks, four churches, several hotels, quite a number of stores, also schools, libraries, public halls, etc., etc. The estimated population in 1890 was 8,000.

SORGHUM. The plant has been extensively cultivated by American farmers since 1856 for the sake of the very palatable molasses produced from it for domestic use. The African variety is called *Imphee.* The Chinese cane is the one usually cultivated here. It grows to a height of nine to eighteen feet wherever corn flourishes, and must be cut before frost.

The saccharine matter is chiefly glucose, but by proper chemical treatment in manufacture a fine granulated sugar may be produced, and this industry has been in some instances undertaken in two or three western States. The product of seed is large, and is valuable as food, though so far such use has been small. The culture of sorghum is precisely that of corn.

SORIA, a province of Spain, in Old Castile, bounded on the north by Logroño, east by Saragossa, south by Guadalajara, and west by Segovia and Burgos; the area is 3,836 square miles. It is a bleak and lofty region, being bounded on three sides by mountains. The whole of the province belongs to the region watered by the Duoro and its affluents. The only important article of trade at present is timber, which is sent to Madrid and Aragon. Soria is divided into five partidos judiciales and 345 ayuntamientos. The population is 153,654. There is a bishop (suffragan of Burgos) resident at Osma. The only town of more than 5,000 inhabitants is Soria.

SORIA, the capital of the above province, is an ancient town, still surrounded by walls which were built in the thirteenth century. The churches of Santo Domingo and San Nicolas, the cloisters of the convent of San Juan, and several other ecclesiastical buildings are fine specimens of Romanesque work of the twelfth and thirteenth centuries. The population is 6,286.

SORREL. A plant used for salad.

SORRENTO, a city of Italy, in the province of Naples, on the north side of the peninsula that separates the Bay of Naples from the Bay of Salerno, about one and a half miles to the east of Capo di Sorrento, crowned by the ruins of a temple of Neptune. Sorrento contains only a few unimportant remains of the magnificent buildings which made it in the time of Augustus a finer city than Naples; and its present prosperity depends mainly on the reputation it enjoys as a summer watering place, with a delightful and healthy climate, and situated amid picturesque coast scenery. The chief local industry is the inlaying of wood. In ancient times the Sorrentine wines had a great repute. The population is 7,000.

SOSIGENES, the astronomer who was employed by Julius Cæsar to reform the Roman calendar, 46 B. C. (see CALENDAR). Of his life nothing further is known, with the exception of two references to him by Pliny, which show that he left some astronomical treatises.

SOTO. See DE SOTO.

SOUBISE, BENJAMIN DE ROHAN DUC DE, was the second son of René II., Vicomte de Rohan, and Catherine de Parthenay, and the younger brother of the soldier-writer Henri de ROHAN (*q. v.*). The seigneury of Soubise came to the Rohans through Catherine, and Benjamin took the title as her second son. The exact date of his birth does not seem to be known, but it is believed to be 1589. He served his apprenticeship as a soldier under prince Maurice of Orange in the Low Countries. But he hardly became an historical character before 1621, when the religious wars once more broke out in France. He and his brother Rohan were the soul of the Huguenot party—the elder brother chiefly taking command on land and in the south, Soubise in the west and along the sea-coast. Soubise's chief performance was a singularly bold and well-conducted attack (in 1625) on the royalist fleet in the river Blavet and the occupation of Oleron. Soubise commanded at Rochelle during the famous siege. When surrender became inevitable he fled to England, which he had previously visited in quest of succor. He died in 1641.

SOUBISE, CHARLES DE ROHAN, PRINCE DE, peer and marshal of France, grandson of the Princesse de Soubise, who is known to history as one of the mistresses of Louis XIV., was born in Paris on July 15, 1715. He accompanied Louis XV. in the campaign of 1744–48, and attained high military rank, which he owed more to his courtiership than to his generalship. Soon after the beginning of the Seven Years' War, through the influence of Madame de Pompadour, he was put in command of a corps of 24,000 men, and on November 4, 1757, he sustained the crushing defeat of Rossbach. After 1763 he lived the life of an ordinary courtier in Paris, dying on July 4, 1787.

SOUDAN, or SÚDÁN (Bilád es-Súdán, "Country of the Blacks"), a term applied by mediæval Arab geographers to the region of Africa south of the Sahara mainly inhabited by people of Negro blood, hence corresponding to the expressions Nigritia, Negroland, at one time current among European writers. It lies mainly between 5° and 18° N. latitude, consequently entirely within the tropics, and in its widest sense stretches right across the continent from Cape Verd on the Atlantic to Massowah on the Red Sea. But the term is more usually restricted to the region bounded north by the Sahara, south by Upper Guinea and the lands draining to the Congo basin, west and east by Senegambia and the Abyssinian highlands respectively. Within these limits it has an extreme length of about 3,000 miles between the Senegal river and Abyssinia, extending southward at some points 660 miles, with a total area of perhaps 2,000,000 square miles, and a population approximately estimated at from 80,000,000 to 90,000,000. From the arid and sandy northern wastes to the well-watered and arable Soudanese lands the transition is effected by an intermediate zone of level grassy steppes, partly overgrown with mimosas and acacias, with a mean breadth of about sixty miles, between 17° and 18° N. latitude, but toward the center reaching as far south as 15° N. Excluding this somewhat uniform transitional zone, the Soudan, properly so called, may be described as a moderately elevated region, diversified with extensive open or rolling plains, level plateaus, and even true highlands, especially in the southwest. It constitutes three distinct hydrographic systems, corresponding to the three main physical divisions of Western Soudan, draining through the Niger southward to the Atlantic; Central Soudan, draining to the great central depression and land-locked basin of Lake Tchad; and Eastern (Egyptian) Soudan, draining through the Nile northward to the Mediterranean.

The climate of Soudan is distinctly tropical, with two well-defined seasons, hot and rainy from April or May to October, warm and dry for the rest of the year. The former is accompanied by tremendous thunderstorms and continuous downpours, flushing all the khors, wadies, and other watercourses, flooding large tracts along the lower courses of the Shari, Logon, Komadugu, and Niger, and interrupting the communications for weeks together in Baghirmi and Bornu. An exuberant forest vegetation is favored by the rich alluvial soil and tropical heat wherever moisture abounds. Of large growths the most characteristic and widespread are—the baobab (*Adansonia*), reaching north to the thirteenth parallel, and attaining a girth of 80 feet; the superb deleb palm, covering extensive tracts especially in the east, where it grows to a height of over 120 feet; the shea or butter tree (*Bassia butyracea*), in the Niger basin and Kong uplands; the cotton-tree, dum palm, tamarind, several varieties of euphorbias, acacias, and mimosas, the heglyg (*Balanites ægyptiaca*), and jerjak of Wadai, which yields a kind of vegetable honey.

The beasts of prey, nowhere very numerous, are chiefly represented by the lion, panther, hyena, and jackal. Elephants in herds of 400 or 500 frequent the swampy districts about Lake Tchad, but are not found farther north than the twelfth or thirteenth parallel. The ordinary African rhinoceros is common, and the rare one-horned species appears to have been met with in Wadai. The wild ass, zebra, giraffe, and antelopes in considerable variety abound on the eastern steppe lands, and endless species of monkeys in the forest districts. Crocodiles, some of great size, from sixteen to eighteen feet long, infest all the large rivers. The hippopotamus also abounds in these waters, which teem with fish.

Politically, Western and Central Soudan are divided into eight independent and semi-independent states, which in their order from west to east are as under:

Bambarra, divided into two nearly equal sections by the Joliba, which traverses it from southwest to northeast, is ruled by the Negro Bambarras of Mandingo stock. It has recently been brought under the influence of the French penetrating eastward from their possessions on the Senegal. The capital is Sego, on the right bank of the Joliba.

Moassina, *Gando*, *Sokoto*, *Adamawa*, the four so-called "Fulah States," occupy the Niger basin between Bambarra and the Binue confluence, the whole of the Binue basin, and the region lying between the Niger and Bornu. *Moassina* (Massina) lies on both banks of the Niger from Bambarra to Kabara, the port of Timbuktu, and is peopled by Fulahs, Bambarras, and Sonrhais; capital Hamda-Alahi, on the right bank of the Niger, below Jenne, which is its chief trading place. Timbuktu, with surrounding district, constitutes a separate territory governed by a kadia, or hereditary mayor, who lately sent an envoy to Paris for the purpose of seeking French protection against the rival Tuareg and Fulah tribes. *Gando*, so called from its capital on an eastern tributary of the Niger, stretches along the main stream southward to the Binue confluence, including the Nufe territory and part of Yoruba. The lower part is extremely fertile, abounding in cotton, indigo, rice, and all varieties of African grains. It comes within the limits of the region over which the British protectorate has recently been extended. Besides the capital, there are several large towns, such as Bida (30,000 to 50,000 inhabitants) in the north; Rabba (40,000 to 50,000), head of the steam navigation on the Niger, and a chief station on the great trade route running from Lagos on the Guinea Coast northward to Gando and Sokoto; Egga (8,000), on the left bank of the Niger, center of the British trade; Lokoja, facing the Binue confluence, an English factory, headquarters of an Anglican mission and seat of a Negro bishop. *Sokoto*, sometimes spoken of as the "empire of Sokoto," is the largest and most powerful of all the Soudanese states, stretching from Gando to Bornu, and from the Binue northward to the Sahara (see SOKOTO). In it are absorbed all the former "Haussa States," and to it Adamawa is also tributary. The inhabitants are chiefly Fulahs and Haussas, intermixed with many aboriginal Negro peoples, especially in the south and southeast. The land is generally fertile, yielding rich crops of cereals, cotton, tobacco, indigo, sugar, yams, black pepper, ginger, melons. The capital and residence of the sultan is Sokoto, in the extreme northwest. Other large towns are—Katsena, before the Fulah invasion a place of 100,000 inhabitants, now reduced to 7,000; Kano, in Barth's time the "London of Soudan," and still with 50,000 souls (Matteucci); Wurnu (15,000); Gombe, in the province of Calam (20,000); Yakoba, or Garu n-Bauchi (150,000); Keffi Abd es-Senga (30,000), in Zegzeg, a great center of the ivory trade, and converging point of the two great caravan routes from the north (Kano) and the west (Egga). *Adamawa*, so named from its Fulah conqueror Adama, and formerly known as Fumbina, or "Southland," is ruled by a Fulah vassal of Sokoto, who keeps in subjection the Battas and innumerable other Negro peoples; it lies between Sokoto, Bornu, and Baghirmi, merging southward in the unexplored equatorial region back of the Cameroons. The capital is Yola, at the northern foot of Mount Alantika. Adamawa appears to be one of the finest and healthiest regions in Africa, splendidly diversified with lofty highlands, fertile valleys, and grassy plains, overgrown in some places with forests of bananas, baobabs, and plantains, in others yielding abundant harvests of cereals, cotton, and indigo. The horses and cattle introduced by the Fulahs thrive well on the rich pastures, and elephants abound in the woodlands.

Bornu, with *Kanem*, in the north, now reduced, and the tributary state of *Logon* in the south, completely encircles Lake Tchad, except at the southeast corner, where Baghirmi is wedged in between Logon and Wadai; it is mostly a flat, low-lying region with fertile plains yielding durrah, maize, cotton, and indigo, watered by the Komadugu, Logon and Shari, all of which flood their banks for miles during the rainy season. The ruling race are the Kanuri, cultured but fanatical Mohammedans of mixed Tibu and Negro stock. The capital of Bornu is Kuka (50,000 to 60,000 inhabitants), near the west coast of Lake Tchad, a great center of the Soudanese trade with the Sahara and Tripolitana, and terminus of the main caravan route from Murzuk (Fezzan) across the desert to the Tchad basin; the capital of Logon is Logon-birni, residence of a vassal prince. Population of Bornu estimated at 5,000,000.

Baghirmi, a Negro state, since 1871 tributary to Wadai, comprises the rich and well-watered plains of the lower Shari, with undefined southern limits. Capital, Masena. Population about 1,500,000, of whom three-fourths are Baghirmi, the rest Kotokos, Fulahs, and Arabs.

Wadai, a powerful Mohammedan state, occupying the whole region between Baghirmi and Kanem in the west and Dar-Fur in the east, and claiming exclusive ivory and slave-hunting rights in the southern (upper) Shari basin. The capital is Abeshr, on a head-stream of the Batha. The country is mainly a hilly plateau rising to 3,000 feet above the sea, and yielding good crops of maize, dukhn, durrah, cotton, indigo. Population four to six millions, chiefly Mabas and other Negroes, and numerous Arab tribes, with some scattered Baghirmi, Fulah, and Kanuri settlements.

Eastern Soudan, comprising Dar-Fur, Kordofan, Senaar, Taka, and the Negro countries on the White

Nile and its southwestern tributaries, respectively called the Equatorial and Bahr-Gazal Provinces, belonged politically to Egypt till the rebellion of the late Mahdi. Since his death in 1885 most of these provinces appear to have lapsed into a state of anarchy and barbarism, in which few vestiges remain of the peace and order introduced by the European officers of the khedive. The Equatorial Province, however, and the Suakin district have been exempt from these troubles—the former being held till 1886 by the governor, Emin Bey, for the khedive, while in the latter the natives themselves succeeded in the same year in putting down the "rebels" or party of Osman Digma. For details of Eastern Soudan, see articles NILE, NUBIA, and SENAAR.

SOULT, NICOLAS JEAN DE DIEU, duke of Dalmatia and marshal of France, was born at Saint-Amans-la-Bastide (now in the department of the Tarn), on March 29, 1769, and was the elder son of a country notary at that place. He was fairly well educated, and intended for the bar, but his father's death when he was still a boy made it necessary for him to seek his fortune, and he enlisted as a private in a regiment of royal infantry in 1785. His superior education ensured his promotion to the rank of sergeant after six years' service, and in July, 1791, he became instructor to the first battalion of volunteers of the Bas-Rhin. He served with his battalion in 1792, and rapidly rose to the position of adjutant-general, colonel, and chief of the staff to General Lefebvre. Soult it was who practically directed the operations of Lefebvre's division in 1794, and after the battle of Fleurus he was promoted general of brigade by the representatives on mission. For the next five years he was constantly employed in Germany under Jourdan, Moreau, Kléber, and Lefebvre. The attack of the French left at the battle of Altenkirchen, which won the day, was directed by Soult, and in 1799 he was promoted general of division and ordered to proceed to Switzerland. It was at this time that he laid the foundations of his military fame, and he particularly distinguished himself in Masséna's great Swiss campaign, and especially at the battle of Zurich. He accompanied Masséna to Genoa, and acted as his principal lieutenant throughout the protracted siege of that city, during which he operated with a detached force without the walls, and after many successful actions he was wounded and taken prisoner at Monto Cretto on April 13, 1800. The victory of Marengo restoring his freedom, he received the command of the southern part of the kingdom of Naples, and in 1802 he was appointed one of the four generals commanding the guard of the consuls. Though he was one of those generals who had served under Moreau, and who therefore, as a rule, disliked and despised Napoleon, Soult had the wisdom to show his devotion to the ruling power; in consequence he was in August, 1803, appointed to the command in chief of the camp of Boulogne, and in May, 1804, he was made one of the first marshals of France.

When Napoleon decided to lead the troops of the camp of Boulogne into Germany, Soult took the command of the right wing, and it was by his capture of the heights of Pratzen that the great battle of Austerlitz was decided. He played a great part in all the famous battles of the grand army, except the battle of Friedland; and, after the conclusion of the peace of Tilsit, he returned to France, and was created duke of Dalmatia. In the following year he was appointed to the command of the second corps of the army with which Napoleon intended to conquer Spain, and, after winning the battle of Gamonal, he was detailed by the emperor to pursue Sir John Moore, whom he only caught up at Coruña. For the next four years Soult remained in Spain, but it is impossible to do more than allude to his most important feats of arms. In 1809, after his defeat by Sir John Moore, he invaded Portugal and took Oporto, but, deluded by the idea of becoming king of Portugal, he neglected to advance upon Lisbon, and was eventually dislodged from Oporto by Sir Arthur Wellesley. After the battle of Talavera he was made major-general of French troops in Spain, and, on November 12, 1809, won the great victory of Ocaña In 1810 he invaded Andalusia, which he speedily reduced, with the exception of Cadiz. In 1811 he marched north into Estremadura, and took Badajoz, and, when the Anglo-Portuguese army laid siege to it, he marched to its rescue, and fought the famous battle of Albuera (May 16th). In 1812, however, he was obliged, after Wellington's great victory of Salamanca, to evacuate Andalusia, and was soon after recalled from Spain at the request of Joseph Bonaparte, with whom he had always disagreed. In March, 1813, he assumed the command of the fourth corps of the grand army, and commanded the center at Lützen and Bautzen, but he was soon sent, with unlimited powers, to the south of France to try and repair the damages done by the great defeat of Vittoria.

Such was the military career of Marshal Soult. His political career was by no means so creditable. After the first abdication of Napoleon he declared himself a royalist, received the order of St. Louis, and acted as minister for war from December 3, 1814, to March 11, 1815. When Napoleon returned from Elba Soult at once declared himself a Bonapartist, and acted as major-general to the emperor in the campaign of Waterloo. For this conduct he was exiled, but not for long, for in 1819 he was recalled and in 1820 again made a marshal of France. He once more tried to show himself a fervent royalist and was made a peer in 1827. After the revolution of 1830 he made out that he was a partisan of Louis Philippe and constitutional royalty, and served as minister for war from 1830 to 1834, as ambassador extraordinary to London for the coronation of Queen Victoria in 1838, and again as minister for war from 1840 to 1844. In 1848, when Louis Philippe was overthrown, Soult again declared himself a republican. He died at his castle of Soultberg near his birthplace in 1851.

SOUND. See ACOUSTICS.

SOUNDING to ascertain the depth of the sea has been practiced from very early times for purposes of navigation, but it is only since the introduction of submarine telegraphy that extensive efforts have been made to obtain a complete knowledge of the contour of the ocean-bed. As early as the middle of last century a few deep soundings were recorded in various parts of the world: Ellis made one in 1749 of 891 fathoms off the northwest coast of Africa.

The operation of sounding is readily performed in shallow water by letting down a weight attached to a cord, which is marked off into fathoms by worsted tucked under the strands, the tens and hundreds being indicated by different colors. The bottom of the weight usually presents a hollow, which is filled with tallow, so that a portion of the material from the bottom may be brought up and give an indication of its nature. Sometimes a valved cavity is used instead of the tallow. It is easy to see that the longer the line let out the greater will be its friction in passing through the water, the more slowly the weight will descend, and the slighter be the shock transmitted to the upper extremity when it reaches the bottom; indeed, at what are now considered very moderate depths this becomes quite imperceptible; hence in deep-sea sounding the line is carefully watched as it runs out, and the time each 100-fathom mark enters the water is noted down. Owing to the increasing friction these intervals gradually lengthen, but any sudden increment indicates that the bottom has been reached, for it shows that the weight has ceased to act, and that further descent of the line is due merely to its own gravitation. For instance, in one of the *Challenger* soundings, with a line one inch in circumference, and with a weight of four hundredweights attached, the time occupied in descending from 2,900 to 3,000 fathoms was 2 m. 10 s.; from 3,000 to 3,100 fathoms 2 m. 13 s., and from 3,100 to 3,200 fathoms 3 m. 14 s., this sudden increase showing that the bottom had been reached in the interval.

SOUTH, ROBERT, one of the wittiest of English divines, was the son of a London merchant, and was born at Hackney, Middlesex, in 1633. He was educated at Westminster school, whence in 1651 he was elected to Christ Church, Oxford. He became B.A. in 1654, and the same year wrote several Latin verses to congratulate Cromwell on concluding peace with the Dutch, which were published in a collection of university poems. The following year he published a Latin poem, entitled *Musica Incantans*. After becoming M.A. in 1657 he was in the habit before obtaining orders in 1658 of preaching as the champion of Calvinism against Socinianism and Arminianism. He was also at this time a strong supporter of Presbyterianism, but on the approach of the Restoration his views on church government underwent a change. In fact he adhered successively to the triumphant party as represented by Cromwell, Charles, James, and William, and there are substantial grounds for the assertion of Anthony Wood that he was much indebted for his preferments to his zeal for "the powers that be." On August 10, 1660, he was chosen public orator of the university, and in 1661 domestic chaplain to Lord Clarendon. In March, 1663, he was made prebend of Westminster, and shortly afterward he received from his university the degree of D.D. In 1667 he became chaplain to the duke of York. In 1678 he was promoted by the chapter of Westminster to the rectory of Islip, Oxfordshire. During the greater part of the reign of Anne, South remained comparatively quiet, but in 1710 he showed himself a keen opponent of Sacheverell. He died July 8, 1716, and was buried in Westminster Abbey.

SOUTH AFRICAN REPUBLIC. See TRANSVAAL.

SOUTHAMPTON, a municipal and parliamentary borough, which gives name to Hampshire, or the county of Southampton, and one of the principal seaports on the south coast of England, is beautifully situated at the head of Southampton Water, forming the mouth of the Test, on a sloping peninsula. Southampton is also a county of itself—the county of the town of Southampton. There are still considerable remains of the old town walls built in the time of Richard II., the most remarkable being a portion of the west walls, with an arcade on its exterior face. In the vicinity of the castle there are some houses of very ancient date, including King's House (Early Norman). The two old churches, St. Michael's (originally Norman about the date of 1080) and Holyrood, have been in a great degree modernized; the former contains a beautiful Byzantine font. The population of the municipal borough (area 2,004 acres) in 1871 was 53,741, and is now 60,051.

SOUTH AUSTRALIA, which lies between 129° and 141° E. longitude, has New South Wales and Victoria on the east, Western Australia on the west, and the Southern Ocean on the south. Originally its northern line was 26° S. latitude, but by the addition of the Northern Territory, or Alexandra Land, the area has been extended from 380,070 square miles to 903,690, and the northern border carried to the Indian Ocean. The length is therefore from latitude 38° S. to 11° S., nearly 2,000 miles. Being much more northern and less southern than the neighboring colony, its present designation is incorrect in point of fact.

The southern coast-line shows two large gulfs, Spencer and St. Vincent—the first 180 miles long, the other 100. Spencer Gulf is open to the ocean, while St. Vincent Gulf is partly shielded by Kangaroo Island, with Investigator Straits as its westerly entrance and Backstairs Passage for an easterly one. Yorke Peninsula separates the two gulfs. Port Lincoln and Sleaford Bay are at the southwest of Spencer Gulf. The ranges of hills are few, rarely reaching 3,000 feet. One chain runs north from Cape Jervis. Flinders range has Brown and Arden, 3,000 feet. Lofty, near Adelaide, is 2,330 feet. Volcanic cones, as Gambier and Schanck, are southeast, near Victoria. In general the country is level, where not slightly undulating. It is far from being well watered, especially to the westward and in the interior. The overland telegraph to Port Darwin passes mostly through an ill-watered country, with oases around springs. The population, 330,000, is principally within 100 miles of Adelaide, the capital, in latitude 35° S. There are 36 counties, 4 pastoral districts, 23 municipalities, and 112 district councils in South Australia proper.

Excepting Western Australia, this is the driest portion of the island continent. In some years only five inches of rain have fallen, even on parts of the sea-shore. The interior, however, has been known to have extensive floods after sudden storms. The heat is considerable during the dry summer time, though cold is felt severely on winter mornings and nights, even in the tropics, when a dozen degrees of frost may be followed in a few hours by a temperature of 80° or 90°. The health conditions of the colony are but little inferior, except in Adelaide and Port Darwin, to those ruling in Tasmania and New Zealand, which are so much cooler and wetter. Diarrhœa may trouble in summer, and catarrh in winter; but, with a birth-rate of thirty-nine in the thousand and a death-rate of from twelve to seventeen, South Australia stands more favorably than England in relation to health.

South Australia, though without coal, was the first Australian colony to have a metallic mine, and the first to possess a gold mine. In 1841 the wheel of a dray, going over a hill near Adelaide, disclosed to view silver-lead ore. In the midst of the bad times in 1843 the Kapunda copper mine was found. In 1845 the wonderful Burra Burra copper was first wrought. The land, 10,000 acres, cost $50,000; and for several years the dividends to shareholders were 800 per cent. per annum. The first colonial mineral export was thirty tons of lead ore, value $640, in 1843. In 1886 most of the mines were closed. Between 250 and 400 miles north of Adelaide a very rich copper district exists. Lead is very abundant. Manganese, nickel, bismuth, antimony, and silver have been mined. Tin is seen in granitic places. Iron occurs in almost all formations and in all conditions. There is abundance of hæmatite, micaceous, bog, and other ores rich in the metal. Talisker and other mines paid in silver. The wonderful Silverton, of Barrier Ranges, in a desert, is just outside the boundary, though 300 miles only from Adelaide while 600 from Sydney. Gold was got from a quartz vein at the Victoria mine, near Adelaide, as early as 1846, but did not pay the company. Partial gold working has been conducted at Echunga, etc., in southern hills. There are rich alluvial and quartz gold mines in Northern Territory, at from 100 to 150 miles south of Port Darwin. For the year 1884 the yield was $389,675. Of 1,349 miners 1,205 were Chinese. Gold is now worked at Waukaringa, 225 miles north of Adelaide. Copper, tin, and silver are found in Northern Territory. Among other minerals asbestos, roofing slates, and fine marbles may be named. Some forty years ago precious stones, especially garnets and sapphires, were gathered in the Barossa Hills. Carbonaceous material is found at the Coorong, etc., yielding fifty per cent of oil. Lake Eyre has a rude coal. Kapunda marble quarry is a success. In 1885 there were 16,493 acres leased for minerals. The value of minerals exported in 1885 was $1,690,660. In 1888 the value of minerals exported was $1,845,070.

South Australia is essentially an agricultural and pastoral colony, to the promotion of which interests the State has lent all possible aid. Forest culture is also extensively engaged in. The land system, too, has been so amended that instead of cash sales, conditional purchases may be made extending over a long period, subject to conditions of residence and cultivation. By December 31, 1888, lands purchased from the Government aggregated 9,140,132 acres and 112,990,720 acres in addition were held under lease for pastoral purposes. In 1889 2,785,490 acres were under cultivation, of which 1,950,000 acres were devoted to wheat. Oats are not cultivated successfully, but potatoes are extensively raised and the culture of flax and hops is receiving some attention. During 1889 42,907,457 pounds of native-grown wool were exported, also 314,406 tons of bread-stuff, the latter valued at $10,988,670. Of fruits, apples and pears are grown everywhere, oranges in many places and strawberries in the hills. The olive oil of South Australia is unsurpassed and vine culture is becoming general. In 1888 the live stock, including horses, cattle, and sheep, numbered 7,750,000 head.

South Australia is not separated from the neighboring colonies by any natural boundaries; hence the fauna includes many animals which are also to be found in the land lying to the east and west. The northern half of the colony lies within the tropics, and possesses a tropical fauna, which is, however, practically identical with that of northern Queensland. In spite of its immense extent north and south, and a corresponding diversity in climate, the colony is poorer in animal life than its neighbors. It possesses thirty-five genera of mammals. These include both the genera of the order *Monotremata*—the *Echidna*, or spiny ant-eater, and the *Ornithorhynchus*, or duck-billed platypus, both of which are found also in eastern Australia and Tasmania. The other order of *Mammalia* associated with Australia, the *Marsupialia*, is well represented in South Australia. It contains seven genera of *Macropodidæ* or kangaroos, including the wallaby and kangaroo rat, four genera of *Phalangistidæ*, or opossums, and five species of *Dasyuridæ*, or "native cats." Two genera of this family are peculiar to the region—the *Chætocercus* and the *Antichinomys;* the latter is found in the interior. It is a mouse-like animal with large ears, and is remarkable for the elongation of its fore-arm and hind-foot and for the complete absence of the hallux. The *Phascolomys*, or wombat, one of the largest of the marsupials, is also found in South Australia, and the curious *Myrmecobius*, or ant-eater of Western Australia. The *Chœropus*, with peculiarly slender limbs and a pouch opening backward, is found in the interior. The remaining *Mammalia* consist of the dingo, or native dog, and a few species of *Muridæ*, the mouse family, and *Cheiroptera*, or bats. There are about 700 species of birds, including sixty species of parrots. Of the nine families peculiar to the Australian region five are well represented, including the *Meliphagidæ* (honey-suckers), *Cacatuidæ* (cockatoos), *Platycercidæ* (broad-tailed and grass-parroquets), *Megapodidæ* (mound-makers) and *Casuaridæ* (cassowaries). The last-named family is represented by the *Dromæus*, or emu, which is hunted in some parts of the colony. Reptiles are fairly represented; there are fifteen species of poisonous snakes. The lizards are very peculiar; South and Western Australia contain twelve peculiar genera. No tailed *Amphibia* exist in the continent, but frogs and toads are plentiful.

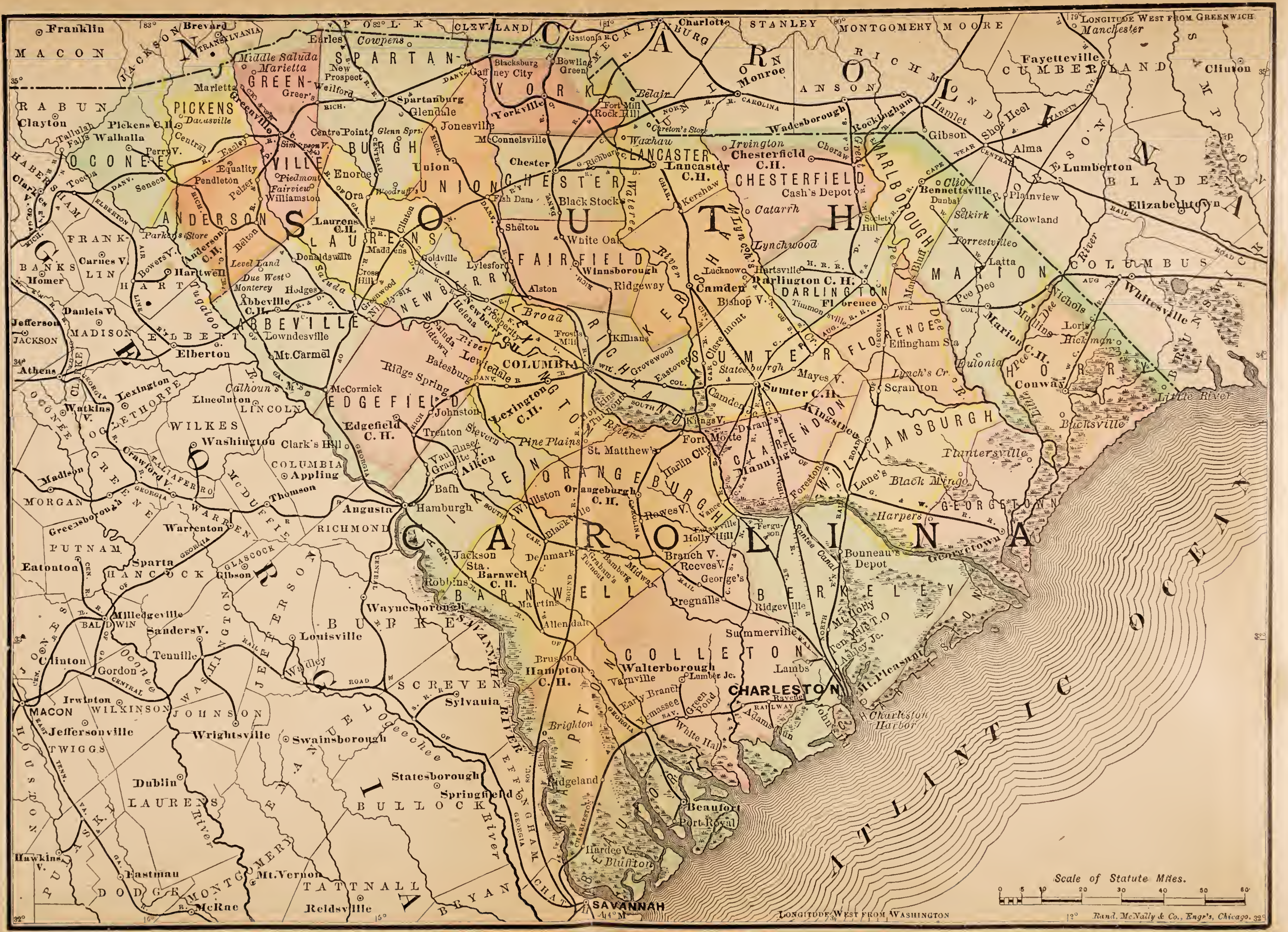
The plant species resemble those of the eastern colonies and Western Australia, but are more limited in variety. The colony, from its dryness, lacks a number known elsewhere. Enormous areas are almost destitute of forests or of timber trees. The *Eucalyptus* family, so valuable for timber and gum as well as for sanitary reasons, are fairly represented. Acacias are abundant, the bark of some being an article of commerce. Flinders range has much of the valuable sugar-gum, *Eucalyptus Corynocalyx*, which is now being preserved in forest reserves. Its timber is very hard and strong, not warping, resisting damp and ants. The head-flowered stringybark, *Euc. capitellata*, has a persistent bark. A sort of stringybark, *Euc. tetrodonta*, is found in Northern Territory. The gouty-stem tree (*Adansonia*) or monkey bread of the north is a sort of baobab. About 500 northern plants are Indian. The *Tamarindus indica* occurs in Arnhem land, with native rice, rattans, and wild nutmeg. The cedar is of the Indian variety. Pines are numerous in the south, palms in the north; among the most beautiful is the *Kentia acuminata*. Banksias are very common in sandy districts. Flowering shrubs are common in the south. There are 130 known grasses in Northern Territory.

Whaling was formerly an important industry about Encounter Bay, as sealing was in Kangaroo Island. The whales have migrated, and the seals are exterminated. On the northern side trepang or bêche-de-mer fishery has commenced, and pearl fisheries have been established. Of fish within colonial waters there are forty-two peculiar genera. The tropical north has similar fish to those of North Queensland, while those of southern bays resemble many of the species of Victoria, Tasmania, and New South Wales. There are the barracouta, bonito, bream, carp, catfish, rock cod and Murray cod, conger, crayfish, cuttle, dogfish, eel, flatfish, flathead, flounder, flying-fish, gadfish, grayling, gurnard, hake, John Dory, ray, salmon (so-called), schnapper, seahorse, shark, sole, squid, swordfish, whiting, etc. Though called by English names, the fish do not always correspond to those in Europe. The Murray cod is a noble freshwater fish.

There is little speculative trade, the shipping being employed in the conveyance of the exports of the colony and the introduction of needful supplies. The imports during 1888 amounted to $27,068,190, of which $11,883,450 came from the United Kingdom. For the same year the exports were valued at $34,920,480, of which $18,993,205 were to the United Kingdom.

Increased attention has been lately directed to local industries, and a more protective tariff has been enforced with a view to their development. The official returns for March 31, 1886, gave 640 works, employing 7,952 men and 1,350 women.

The district councils have charge of many of the roads. The general dryness of the country is favorable to the condition of roads. Railways have been constructed for the conveyance of farming produce to market, the carriage of minerals to port, and the tapping of the Murray river traffic from the East. At the beginning of 1889 there were 1,500 miles of railway open, and 324 in course of construction. There are several tramways, supplementing railway traffic, and 5,509 miles of telegraph lines.


SOUTH CAROLINA
N. CAROLINA
GEORGIA
ATLANTIC OCEAN
OCONEE
PICKENS
GREENVILLE
SPARTANBURGH
YORK
LANCASTER
CHESTERFIELD
MARLBOROUGH
ANDERSON
ABBEVILLE
LAURENS
NEWBERRY
UNION
CHESTER
FAIRFIELD
KERSHAW
DARLINGTON
MARION
HORRY
EDGEFIELD
LEXINGTON
RICHLAND
SUMTER
CLARENDON
WILLIAMSBURGH
GEORGETOWN
AIKEN
ORANGEBURGH
BARNWELL
BERKELEY
COLLETON
HAMPTON
BEAUFORT
FLORENCE
COLUMBIA
CHARLESTON
SAVANNAH
Augusta
Charlotte
Columbia
Greenville
Spartanburg
Yorkville
Rock Hill
Chester
Winnsborough
Camden
Sumter C.H.
Florence
Darlington C.H.
Bennettsville
Cheraw
Marion C.H.
Conway
Georgetown
Kingstree
Manning
Orangeburgh C.H.
Aiken
Barnwell C.H.
Edgefield C.H.
Lexington C.H.
Newberry C.H.
Abbeville C.H.
Laurens C.H.
Anderson C.H.
Pickens C.H.
Walhalla
Union
Lancaster C.H.
Chesterfield C.H.
Walterborough
Hampton C.H.
Beaufort
Port Royal
Bluffton
Summerville
Mt. Pleasant
Charleston Harbor
Hamburgh
Wilmington
Wadesborough
Rockingham
Monroe
Lumberton
Fayetteville
Whitesville
Elizabethtown
Macon
Milledgeville
Athens
Elberton
Washington
Waynesborough
Louisville
Statesborough
Little River
Savannah River
Santee Canal
Broad River
Wateree River
Scale of Statute Miles.
0 5 10 20 30 40 50 60
Longitude West from Greenwich
Longitude West from Washington
Rand, McNally & Co., Engr's, Chicago.
35°
34°
33°
32°
83°
82°
81°
80°
79°
19°
16°
15°
13°
12°

The government is aiding the railway movement for opening out the interior by the construction of waterworks and public reservoirs. To supply Adelaide, independently of the Torrens river, there has been an expenditure of $4,332,710. Kapunda has a reservoir of 41,200,000 gallons; Port Pirie of 25,700,000; Mount Barker of 6,000,000; Port Augusta of 666,000; Mount Gambier and Gawler each of 279,000. There are large storage tanks at many places, *e.g.*, for 810,000 gallons at Moonta.

The governor is the representative of the crown. The legislative council of twenty-four members, one-third retiring every three years, is chosen by 32,000 electors. The house of assembly, of fifty-two members, is appointed for three years by 60,000 electors. Responsible government dates from 1856. The public debt, contracted for useful public works, was $95,738,500 in 1888. For the year 1888-89 the revenue was $12,472,780, and the expenditure was $11,831,995.

The law is administered by a chief justice, two puisne judges, a judge for the Northern Territory, and a commissioner of bankruptcy. Local courts are presided over by fifteen stipendiary magistrates, and various benches of magistrates in different parts of the country.

Including the Northern Territory the population in 1890 was estimated in round numbers at 350,000. The places of public worship provided numbered 1,500, which gave about 235,750 seats; the Sunday-schools numbered 750, with 60,000 scholars.

The capital is Adelaide, and there are many important and growing towns distributed throughout the colony. The population of Adelaide and suburbs on January 1, 1890, was estimated at 125,000. No Australasian colony has done so much for the good of the aborigines and the advance of good morals as South Australia. The administration is just and firm, being well sustained by public sentiment.

Not being so wealthy as its eastern neighbors, the colony has not been able to devote so large an amount to schools; still, a grant of $6,300,000 was made during 1884-85 toward the instruction of 50,000 pupils. Of 450 schools, half are called public, half provisional for thinly-peopled districts. Payment from scholars is not dispensed with as in Victoria. Lands are being set apart as educational grants for the future. All religious denominations are equal in the sight of the law, none receiving any state aid. Bible reading is sanctioned before school hours, and any religious lessons may be given at the close of school time. The Adelaide university, so richly endowed by the colonists, receives an annual grant of $12,750 from the local parliament. In 1888 there were 536 government and 363 private schools, with 934 and 767 teachers, respectively; there were also 134 county institutes and libraries of 118,484 volumes. Bank assets were $53,788,310, and $5,389,746 in savings banks.

SOUTH BEND, the county seat of St. Joseph county, Ind., is situated at the southern bend of the St. Joseph river, eighty-five miles southeast of Chicago, twenty-eight miles east of La Porte, sixteen miles west of Elkhart, and ten miles south of Niles, Mich., being connected with the latter point by a branch of the Michigan Central railroad. The city, which is one of the leading manufacturing centers of Indiana, is also located on the main line of the Michigan Southern and Grand Trunk roads, and is the terminus of the Vandalia line. All of these corporations have made substantial improvements in the city, including the erection of depots, freight-houses, etc. The river is also navigable for small craft, and furnishes abundant and valuable water power. The manufactures embrace carriages, wagons, buggies, furniture, agricultural implements, sewing-machine attachments, chairs, harvesting machinery, flour, wool, paper, brick, patent medicines, sash, doors, and blinds, clothing, jewelry, yarns, etc., etc. There are one savings and two national banks in operation in the city and two daily and two weekly papers are published in addition to a semi-monthly magazine. The city also contains seventeen churches, the St. Joseph's Academy, a high school and subordinate departments of the common school system, a courthouse, a large number of stores, and many public buildings and private residences noticeable for their substantial construction and architectural superiority. The University of Notre-Dame (Catholic) is located a short distance from the city. Street cars, electric lights, and all modern improvements have been established at South Bend and are liberally maintained. The population in 1860 was 3,832; in 1870, 7,206; in 1880, 13,280; and in 1890, 21,819.

SOUTH BETHLEHEM, one of the leading and representative towns of Northampton county, Penn., is situated on the Lehigh Valley and North Pennsylvania railroads, and on the south bank of the Lehigh river opposite the manufacturing town of Bethlehem. Among the chief features of South Bethlehem are the unsurpassed educational facilities present there. It is the location of Lehigh University (Episcopal) founded through the liberality of the Hon. Asa Packer and provided by that gentleman with a library of 70,000 volumes, together with a gymnasium, chemical laboratories, and other appointments; also of the Bishopthorpe school (Episcopal) for young ladies, in addition to academies and graded schools. The town contains two banks, one daily paper, six churches, hotels, public halls, etc., and St. Luke's hospital, also organized and endowed by Mr. Packer. The productive industries are quite extensive and equally leading. They are made up of Bessemer steel-works, engine and boiler works, brass and zinc works, silk and knitting mills, hosiery, planing and flour mills, with other enterprises of a varied and valuable character. The population in 1890 was 10,302.

SOUTHBRIDGE, a bustling, busy town in Worcester county, Mass., and the business center for most of the towns in the southern portion of the county, is availably situated on the Quinnebaug river, thirty miles east of Springfield, seventy miles from Boston, and twenty-one miles from Worcester. It is also located on a branch of the New York and New England road, by which it is easily accessible from all directions, and is the seat of considerable manufacturing. It contains two banks, two weekly papers, high school and academy, six churches, many stores, hotels, etc. Factories for woolen and cotton goods, prints, hats and caps, together with standard articles in the lumber and metal industries are in constant operation, and their combined annual products represent hundreds of thousands of dollars in value. The population in 1890 was returned at 7,744.

SOUTH CAROLINA, one of the original thirteen States of the American Union, commonly known as the Palmetto State, from the abundance of this kind of palm on the coast, once comprised the southern or lower portion of what was formerly styled Carolina, and subsequently divided into North and South Carolina. It lies between 32° 4′ 30″ and 35° 12′ N. latitude and between 78° 25′ and 83° 49′ W. longitude. In shape it is an irregular triangle, the vertex resting upon the Blue Ridge mountains in the extreme northwest, while the Atlantic forms its base. It is bounded north and northeast by North Carolina, southeast by the Atlantic, and southwest by the Savannah river, which, with its tributaries, the Tugaloo and Chatauga, separates it from

Georgia. The State is 189 miles long and 160 broad, containing 30,961 square miles or 19,815,040 acres, and is divided into thirty-four counties (formerly districts). At the census of 1880 the population numbered 995,577; in 1890 it had increased to 1,151,149. The surface may be about equally divided, into high, middling, and low land, the last-named rising from the sea-coast, where it is very flat and level, and gradually increasing in elevation toward the interior, where it attains a mean of 250 feet, continuing to the north line, where, after varying from 300 to 800 feet it reaches its highest elevation of 1,000 feet. The land along and near the coast is low, marshy, and swampy, especially on the rivers' banks, rolling and diversified toward the center, and undulating near the mountain slope, but in places abrupt, King's Mountain rising almost perpendicularly 500 feet. The chief elevations in this section are the Saluda Mountains, spurs of the Blue Ridge, King's Mountain (1,692 feet), Paris Mountain (2,054 feet), Table Rock (3,000 feet), Cæsar's Head (3,118 feet), and Mount Pinnacle (3,436 feet). This region abounds in beautiful and picturesque scenery, rendering it attractive to tourists, and making it a great summer resort.

The land is irrigated and well-drained by numerous rivers, the largest of which is the Santee, formed by the Saluda, Congaree, Catawba, and Wateree, uniting at the center of the State. The other rivers of any size are the Waccamaw, Lynch's, Great and Little Peedee, forming the Peedee, Black, Wando, Ashley, Cooper, Edisto, Combahee, Ashepoo, Coosaw, Port Royal, and Broad (on the coast), this last being more of a bay. The sea-coast is fringed by numerous islands, and indented by bays and inlets—Winyaw, and Bull's Bays, Charleston Harbor, Stono Inlet, North and South Edisto Inlets, St. Helena Sound, and Port Royal—the last one of the finest harbors in the world, as its name, said to have been given on this account by the early discoverers and explorers, would imply. The entire coast south of Winyaw is composed of a network of creeks and sounds, so that, for small craft, navigation inland may be had from this point to the mouth of the Savannah on the extreme southwest. Most of the rivers rising in the mountains are navigable nearly to the foot-slope. Here numerous rapids and waterfalls afford excellent mill-power. Canals throughout the State are not numerous, the few formerly in use having been abandoned in favor of the railroads. The Santee canal, connecting that river with the headwaters of the Cooper, twenty-two miles in length, has given place to the North-Eastern railway.

The climate of South Carolina is mild and genial, snow falling in the mountains but rarely in the middle sections, and seldom or never along the coast. The sea islands generally, as well as the pine barrens, are healthy, furnishing the planter with a summer home and safe retreat from the malaria of the rice lands. These regions were formerly innocuous to the whites, as they still are to the negroes, but subsequent clearance and cultivation have rendered them fatal in summer. The midlands are considered healthy in all parts except here and there along the creeks, while the mountain region is unexceptionable.

The coast of South Carolina, like places in the same latitude, is subject to violent storms, tornadoes, and cyclones, which make their annual visits on or about the autumnal equinox, doing much damage. Till quite recently the district has never been seriously troubled with earthquakes. Slight tremors have indeed been felt and recorded since 1754, without, however, causing serious injury. But on the night of August 31, 1886, Charleston was visited by an earthquake which was followed by other shocks and tremors, which continued night and day at intervals with greater or less violence. The main shock was very destructive to property, while about forty lives were lost, and many persons injured. Crevices several yards in length and varying from one to four inches in width appeared, and in some places in the suburbs of the city fissures of much larger proportions threw up water to the height of several feet. There was no warning given except that in the small town of Summerville, about twenty-two miles to the north, considerable disturbance was caused by thuds and tremors with detonations on the 27th and 28th, felt on the latter date to some extent in Charleston. The violence of these shocks was confined almost exclusively to this State, though they were felt in a slighter degree in Georgia and North Carolina.

The soil in the low country is remarkably fertile, the river swamps and reclaimed marshes being admirably adapted to the cultivation of rice, while the sandy loam of the sea islands and surrounding main produces the finest long staple, black seed, or sea island cotton of silky fiber. As we recede from the salt the staple becomes shorter and the plant has a less luxuriant growth. The rice produced here, noted abroad as Carolina rice, is considered first in the markets of the world. The State was the first to introduce rice culture in America, the seed having been brought in 1693 by a vessel from Madagascar. Abundant crops are raised of wheat, rye, maize, oats, barley, buckwheat, peas, beans, sugar, tobacco, indigo, sorghum, broom-corn, sunflower, guinea-corn, sweet and Irish potatoes, hemp, flax, and hops. Numerous orchards, all over the State, furnish quantities of apples, pears, quinces, plums, peaches, nectarines, apricots, cherries, and along the coast figs, oranges, lemons, olives, and pomegranates. The raspberry, blackberry, mulberry, and whortleberry are produced. The strawberry is extensively cultivated along the coast, and shipped in immense quantities to the northern markets. Of nuts, the walnut, pecan, chestnut, hickory, shell-bark, hazel nut, and chinquapin may be mentioned. The grape grows wild in many portions of the State, and in great varieties, which, when cultivated, yield a delicious wine. In certain sections hundreds of acres are devoted to the culture. The gardens and farms produce in abundance turnips, beets, parsnips, carrots, artichokes, mustard, benne, rhubarb, arrowroot, water and musk melons, cucumbers, cabbages, kale, lettuce, cayenne pepper, squashes, okra, pumpkins, onions, leeks, beans, radishes, celery, green peas, and tomatoes—the last two from early spring to mid-winter. The jasmine, Cherokee rose or nondescript, wild honeysuckle, and sweet-brier perfume the woods; the dog-wood and fringe tree abound in the forest; and garden flowers in the cities, especially Charleston, Columbia, and Beaufort, are the admiration of strangers. Conspicuous among these are the *Camellia japonica* of all varieties and shades, azalea in every hue, roses of numberless descriptions, hyacinth, snowdrop, violet, dahlia, tulip, verbena, sweet olive, and heliotrope. Valuable and almost inexhaustible forests extend over the greater part of the State, the long leaf or yellow pine, confined chiefly to the low country, covering 10,000,000 acres, and furnishing immense quantities of timber, tar, pitch, turpentine, and rosin. Here and elsewhere are found the magnolia, sweet and black gum, white, water, red, and live oak, black walnut, elm, hickory, maple, sycamore, ash, cypress, chestnut, beech, locust, persimmon, dogwood, poplar. The palmetto is peculiar to the coast.

The forests abound in deer, wild turkeys, foxes, wild cats, raccoons, opossums, rabbits, and squirrels; and along the water-courses are found the musk otter, etc.

Among the birds are pigeons, doves, partridges, woodcock, snipe. immense flocks of wild ducks, including the English or canvas-back, teal, blackhead, etc. Fresh-water fish of every variety are taken in all the streams in the interior, and the bays and inlets furnish whiting, mackerel, bass, flounder, sheephead, shad, mullet, blackfish, sturgeon, terrapin, turtle, shrimps, crabs, and oysters. Quantities of salmon and carp have been furnished by the fish commissioners for stocking the waters.

Minerals are liberally diffused over the State. Gold is found in Lancaster, York, Union, Spartanburg, Greenville, Pickens, and Abbeville counties; copper in York, Spartanburg, and Pickens; lead in the last; iron of a superior quality in Union, Spartanburg, Greenville, and Pickens; manganese in Lancaster, York, Chester, Union, Spartanburg, Greenville, Pickens, Anderson, Abbeville, and Edgefield; bismuth in Chesterfield and Lancaster; plumbago in Spartanburg; soapstone in Fairfield, Chester, York, Spartanburg, Laurens, Greenville, Pickens, Abbeville, and Edgefield; coal in Chesterfield and Marlboro. Limestone abounds in nearly all the upper counties, but chiefly in Laurens and Spartanburg. The finest blue and gray granite is found in the middle and upper sections; sandstone, burrstone, and flagstone in Edgefield, Pickens, York, and Fairfield. Pottery and porcelain clay, quartz, and sand for glass exist in many places. Tuomey states that "the aluminous formations that occur in immense beds of the finest porcelain clay are often exposed by the denuding effects of water, and lie in rich strata upon the very surface, ready to the hand of the manufacturer. Between Aiken and Graniteville the beds are in many cases sixty feet thick, while those in the Savannah river near Hamburg are from ten to fifteen feet and of unsurpassed purity." The Aiken council committee report in this vicinity immense beds of different kinds of clay, from the purest and whitest kaolin to the dark-colored mud of which bricks are made, sands of all hues, some as fine as flour, others with large coarse crystals, siliceous earths of many kinds, ferruginous sandstones, conglomerate shell, burrstone, mica, feldspar, and ochers of different colors. But a short distance off a deposit of magnesia is found, and potash can readily be made in the surrounding forests. Experts have pronounced the sands to be admirably adapted for making glass and crystal, and the quality of the kaolin is admitted to be equal, if not superior, to that of which Staffordshire ware is made. It is doubtful if the combination of the ingredients of glass and earthenware can be found in such immediate proximity anywhere else. Mineral springs exist in several of the upper counties.

Railroads are on the increase. The South Carolina railway, between Charleston and Augusta, Ga., was at the time of its completion the longest continuous railroad in the world.

During the war railway enterprises were practically abandoned, and for some years after the surrender little was accomplished looking to their revival. Within the past fifteen years, however, steady progress has been made. There are at present (1890) thirty-six lines operating in the State, with a total stock and debt of $58,307,959.93, and a total length of 2,252.28 miles. Railway construction still continues, placing the productive and other portions of the State in easy communication with the most available markets, and otherwise contributing to the material development of that section of the country. At the last session of the legislature the railroad law was amended, authorizing railroad commissioners to regulate fares, rates, etc.

Manufactures are growing in importance; chief among them are cotton yarn and cloth, flour, lumber, turpentine, and fertilizers. The capacity of twenty-nine mills now in operation is estimated at 14,821,166 pounds of yarn, 79,442,327 yards of cloth, and the value of product $9,097,464. In 1880 there were 82,324 spindles and 1,676 looms; in 1884 195,112 spindles and 3,652 looms. The number of lumber mills at work is 729, employing 5,894 hands and a capital of $2,920,870. The value of their annual production is $5,592,565. Of turpentine stills there are 291, with 6,991 hands and a capital of $1,454,800, with an annual production to the value of $2,912,271. These figures show an increase of 100 per cent. in less than four years. The fertilizers are valued at $3,346,400, and the miscellaneous manufactures at $2,114,680. The whole value of manufactured products was in 1860 $8,615,195; in 1870, $9,858,981; in 1880, $16,738,008; in 1884, $32,324,404, and is rapidly increasing. South Carolina phosphates are of recent date, but their importance may be shown by stating that they pay yearly, by direct taxation, an amount for royalty which is 20 per cent. of the whole income of the State. The value of this rock was first pointed out by Mr. Jonathan Lucas, a planter, who afterward materially assisted in developing its usefulness. The first company, the Charleston South Carolina Mining and Manufacturing Company, was formed in 1867. There are now fourteen land and eleven river mining companies with capital ranging from $10,000 to $200,000. In addition to these there are a number of individuals who are licensed by the state to mine in the navigable streams, employing an estimated capital of about $50,000. The total amount of phosphate rock mined and shipped since 1868 was 2,290,000 tons. Of this amount 1,078,070 tons were river and 1,211,830 land rock. The capital invested in the former is $525,000, and 649 hands are employed (wages $259,300), with an annual production of $907,170; in the latter the corresponding figures are—capital, $1,980,000; hands, 1,286; wages, $363,560; production, $1,283,830.

The six gold-mining counties report eleven mines in operation, employing 600 hands, with a capital of $440,000 and an annual production of $90,000. The same counties report eighteen gold mines or gold-bearing areas not now worked; one of the mines has a capital of $40,000. Ten counties report quarries or kaolin beds. Worked and unworked, there are twenty-five granite quarries, five kaolin beds, and one soapstone quarry. There are also in the State large unworked deposits of mica, pyrites, corundum, and marl, with some silver. The quarries and kaolin works, with a capital of $96,350, have an annual production of $220,000.

The upland cotton crop of 1887 was 595,342 bales of 400 pounds. The corn area was 1,501,332 acres, and the production 15,013,000 bushels. 397,188 acres in oats yielded a crop of 4,607,000 bushels. Of wheat (192,637 acres) the yield was 1,233,000 bushels.

The proportions of white and colored labor in the State are about 30 per cent. and 70 per cent. respectively. The rate of wages paid is from $8 to $9 a month for men and $6 for women, with board. About 23 per cent. of white women and children work on the farms, and about 61 per cent. of the colored. The systems used are—the contract, in which services rendered are paid by giving the laborer the use of the land and house, or where the wages are paid monthly, or a portion monthly and the remainder at the end of the year; and the tenant system, in which the laborer rents the land, and from the crop pays the landlord the rent and for the use of the animals. Land varies in price from 50 cents for pine barren to $100 for choice farming land.

Horses and mules are raised at very little cost. Ordinary scrub cattle are seldom housed, roaming the forests at will, except when herded for branding or for driving to market. Sheep thrive away from the salt, and are profitable in the mountains. Hogs, not improved breeds, like cattle, have the liberty of the woods, and are taken with dogs when needed.

Free schools trace their origin as far back as 1710. A system of free schools was inaugurated in 1811. The present public-school system was established in 1868. It provides free instruction to pupils of both races, in primary and intermediate grades. Their management is under the direction of the State board of examiners, consisting of the State superintendent of education, and four other persons appointed by the governor. In each county the school commissioner is elected by the people for two years. The schools are supported entirely by taxation. There are 3,948 public schools in the State. The number of pupils enrolled in 1890 was 201,260; classified according to race as 89,372 white, 111,888 colored. The number of white teachers employed is 2,688, colored 1,676, making a total of 4,364. There are 3,264 public school-houses valued at $447,352. Institutions for higher education, supported by the State, are the South Carolina College and South Carolina Military Academy for white males, and the Claflin College for colored persons of both sexes; also the Normal College and Winthrop Training School. There is an institution for the education of the deaf, dumb, and blind. There are, besides, numerous private schools and colleges.

Churches of all denominations multiplied in the State during the colonial period, and subsequently Episcopalians, Presbyterians, Independents, Baptists, and French Protestants established congregations in Charleston just after 1680. Methodists and Romanists came a century later, Jews in 1756, German Lutherans in 1759. The colored people are for the most part Methodists, some being Baptists and Presbyterians, a few Episcopalians.

CHARLESTON *(q. v.)* is the largest city of the State. COLUMBIA *(q. v.)*, the capital, has (1890) a population of 15,353, while that of Charleston is 54,955. Greenville, in the northwest portion of the State, is a growing railway center and manufacturing city, with a population of 8,607. Georgetown and Beaufort on the coast do a good shipping business in lumber and other exports. Spartanburg and Aiken are important places, the former as a railway center, the latter as a health resort for invalid strangers in winter, when the population is more than doubled. Other towns are Newberry, Orangeburg, Florence, Camden, Sumter, Graniteville, Chester, Anderson, Abbeyville, Winnsboro, Yorkville, Union, Cheraw, Walhalla, Piedmont, Port Royal, Marion, Darlington, Lancaster.

The executive department consists of a governor, lieutenant-governor, who is *ex officio* president of the senate, comptroller-general, treasurer, secretary of State, attorney-general, and a superintendent of education; these are elected by the people, to serve two years. The legislative department embraces a senate and a house of representatives, which together are called the general assembly.

The first attempt to settle Carolina was in 1562, when Admiral Coligny obtained from Charles IX. of France permission to plant a colony of Protestants on the coast of Florida. An expedition was fitted out at the expense of the crown, and placed under the command of Jean Ribault. Fear of the Spanish perhaps induced them to change their plans, and, entering Port Royal, they landed on Lemon Island, which they named, in honor of the king, Arx Carolina. Leaving a sufficient number to garrison the fort Ribault returned to France. Two years later a second expedition under Laudonnière, one of Ribault's men, was fitted out, but on landing at Port Royal found no trace of the former, it was massacred by the Spaniards from Florida. A century later the English effected a permanent settlement in the State. During the Revolutionary War South Carolina was a conspicuous and potent factor, contributing largely of men and means to the war for independence, and being also the location of a number of important battles which were won by the colonists, and did much to determine the ultimate result. During the Seminole and Mexican wars the State was equally prominent and patriotic. The State seceded in 1861, and while the Civil War continued was the scene of active operations between the Federal and Confederate armies. (See UNITED STATES.)

SOUTHCOTT, JOANNA, was born in Devonshire, Eng., about 1750, and was for a considerable time a domestic servant. She was originally an adherent of the Methodists, but, becoming persuaded she possessed supernatural gifts, she wrote and dictated prophecies in rhyme, and announced herself as the woman spoken of in the Apocalypse (ch. xii.), affirming, when beyond the age of sixty, that she would be delivered of Shiloh on October 19, 1814. For some days previous to this she was attended by her followers night and day, but Shiloh failed to appear, and it was given out that she was in a trance. She died of dropsy on the 29th of the same month. Her followers are said to have numbered over 100,000, and so late as 1889 they were not extinct.

SOUTH DAKOTA became a State on November 3, 1889. The statistics and history of the State are given under the head DAKOTA *(q. v.)*. The State is bounded on the north by North Dakota; west by Wyoming and Montana; south by Nebraska, and east by Minnesota and Iowa.

SOUTH EASTON, a borough of Northampton county, Pa., is situated on the south bank of the Lehigh river, opposite Easton, of which it is practically a suburb. It has extensive manufactories of cotton goods, wire, and other articles and a population of 6,000.

SOUTHEND, a watering-place of Essex, Eng., situated on the north bank of the Thames, five miles west of Shoeburyness, and by the London, Tilbury, and Southend railway, forty-two miles east of London, with which it is also connected by steamer. The population of the urban sanitary district (area, 3,441 acres) in 1871 was 4,561, and in 1881 it was 7,979.

SOUTHERNE, THOMAS, Irish playwright, "Honest Tom Southerne," to give the author of *The Fatal Marriage* the name by which his contemporaries usually called him, was a clever craftsman for the stage. Born in Dublin in 1660, he went to London and entered the Middle Temple in 1678, but only to desert law very speedily for dramatic authorship. His first play was *The Persian Prince, or the Loyal Brother*. After an interval of active service more plays followed, and were produced with equal success; of these *The Fatal Marriage* (1694), known also by the name of its heroine, "Isabella," has the best claim to remembrance. *Sir Anthony Love, or the Rambling Lady*, in which the hero assumes female disguise without accession of modesty, is a good example of the rest. He died in 1746.

SOUTHEY, CAROLINE, English authoress, the second wife of Robert Southey, was born at Lymington, Hants, Eng., on December 6, 1786. Her first literary venture was the sending anonymously of a narrative poem called *Ellen Fitzarthur*, to Southey, and this led to the acquaintanceship and lifelong friendship which, in 1839, culminated in their marriage. Mrs. Southey's poems were published in a collected edition in 1867. Her prose is on the whole more interesting than her verse, though—with rare exceptions—infected with like dulness. Among her prose writings may be mentioned *Chapters on Churchyards* (1829), her best work; *Tales of the Moors* (1828): and *Selwyn in Search of a Daughter* (1835). Mrs. Southey died at Buckland Cottage, Lymington, on July 20, 1854, two years after the queen had granted her an annual pension of $1,000.

SOUTHEY, Robert, was born in Bristol, Eng., on August 12, 1774. He was sent to several private schools, and had good fortune at none of them; in 1788 he went to Westminster, where he was scarcely more fortunate. After a brief sojourn he was expelled in 1792, because an essay of his on flogging, in a school magazine called *The Flagellant*, was resented by Dr. Vincent, the head-master. He was refused at Christ Church on account of his essay in *The Flagellant;* but Balliol gave him a home. At Oxford he led his own life, lived in his own thoughts, and got little or nothing from the university. In literature he found his proper sphere; and in 1803 he settled down in his lifelong home, Greta Hall, near Keswick. Henceforth his years were even and uneventful. He wrote and read with mechanical, with appalling regularity; his library grew to 14,000 volumes. He had children, and lost several; and his house was a refuge for the wife and family of Coleridge. With Wordsworth and Landor he formed close friendships. In 1813 he was made poet-laureate; and some years before his death he was offered a baronetcy—which, however, he with good reason declined. He died on March 21, 1843; he is buried, near his first wife and her children, in Crosthwaite churchyard.

SOUTH HADLEY, a post-village of Hampshire county, Mass., with a population of over 5,000. It is the seat of Mount Holyoke Female Seminary. The village of South Hadley Falls in this township possesses valuable water-power and is an important manufacturing point.

SOUTHINGTON, a town of Hartford county, Conn., twenty-two miles north of New Haven. It has important manufactories of cutlery, hardware, and carriages and a population of 5,200.

SOUTH NORWALK, a city of Fairfield county, Conn., is situated on the Norwalk river, nearly half way between New York and New Haven.

It contains one daily and two weekly papers, one savings and two national banks, academies and schools, and is the location of a military institute. The manufactures embrace straw and felt hats, shoes, paper boxes, springs, locks, iron fences, hardware specialties, carriages, models, furnaces, etc. Population, 5,600.

SOUTH OMAHA (8,062), Douglas county, Neb. (See Omaha.)

SOUTHPORT, a municipal borough of Lancashire, England, and a favorite seaside resort, is situated between the estuaries of the Mersey and the Ribble, eighteen miles north of Liverpool, and is a terminal station of three railway systems. In 1867 the town received a charter of incorporation, and since then its progress has been remarkable. In 1871 the population of the borough (area 7,526 acres) was 18,086; in 1881 this had grown to 32,206. Its sanitary arrangements are very perfect, and the water supply is abundant and excellent. Southport gives its name to one of the parliamentary divisions of south west Lancashire.

SOUTH SHIELDS. See Shields, South.

SOUTHWARK. See London.

SOUVESTRE, Émile, a French novelist of merit, was born on April 15, 1806, and died on July 5, 1854. His best work is undoubtedly to be found in the charming *Derniers Bretons* (1835–1837) and *Foyer Breton* (1844) (where the folklore and natural features of his native province are worked up into story form, with a success hardly excelled by any other writer), and in *Un Philosophe sous les Toits*, which received the honor of an academic prize in the year 1851.

SOWERBY, James, was born in 1757, was at first a painter, but soon applied his art to the illustration of botanical and conchological works, which are still highly valued, especially his *English Botany* (12 vols. 8 vo., 1846). His son George (1788–1854) followed in his father's steps, and produced a monumental work on conchology. He died in 1822.

SOWERBY BRIDGE, a manufacturing town in the West Riding of Yorkshire, England, is situated on both sides of the river Calder, at the termination of the Rochdale canal, and on the Lancashire and Yorkshire railway, two miles southwest of Halifax, and eight northwest of Huddersfield. The population of the urban sanitary district (area 536 acres) in 1871 was 7,041, and in 1881 it was 8,724.

SOZOMEN, church historian. Hermias Salamanes (Salaminius) Sozomenus came of a wealthy family of Palestine, and it is exceedingly probable that he himself was born (not later than 400 A.D.) and brought up there—in Gaza or the neighborhood. What he has to tell us of the history of South Palestine was derived from oral tradition. When compared with the history of Socrates his history is plainly seen to be a plagiarism from that work, and that on a large scale. Some three-fourths of the materials essentially in the same arrangement have simply been appropriated from his predecessor without his being so much as named even once, the other sources to which Sozomen was indebted being, however, expressly cited. All that can be said to the credit of Sozomen is that he has been himself at the trouble to refer to the principal sources used by Socrates (Rufinus, Eusebius, Athanasius, Sabinus, the collections of epistles, Palladius), and has not infrequently supplemented Socrates from them, and also that he has adduced some new authorities, in particular sources relating to Christianity in Persia, Arian history, monkish histories, the *Vita Martini* of Sulpicius, books of Hilarius; the whole of the ninth book is entirely drawn from Olympiodorus.

SPA, a watering-place of Belgium, in the province of Liége, twenty miles by rail from Liége *via* Pepinster, is beautifully situated, at a height of 814 feet above the sea, in the valley of the Wayai (a small sub-tributary of the Meuse). The population of the commune was 6,930 in 1884. Several springs in the neighboring district are nearly as celebrated as those of Spa proper; the Sauvenière waters, supposed to be effective against sterility, are half a mile distant.

SPAGNA, Lo, the usual designation (due to his Spanish origin) of Giovàni di Pietro, one of the chief followers of Perugino. Nothing whatever is known of his early life, or of the circumstances under which he became a member of the Perugian school. A large number of panel pictures by him exist, of which some are painted with much grace and refinement of touch. Lo Spagna was alive in 1528, but he appears to have died before 1530.

SPAGNOLETTO. See Ribera.

SPAIN, a country rather more than twice the size of Great Britain including the adjacent small islands, constitutes in its mainland portion about eleven-thirteenths of the Iberian Peninsula, and has in addition an insular area (in the Balearic and Canary Islands) of nearly 5,000 square miles. On all sides except that of Portugal the boundaries are natural, the peninsula being separated from France by the Pyrenees and on every other side being surrounded by the sea. On the side of Portugal a tract of inhospitable country led originally to the separation between the two kingdoms, inasmuch as it caused the reconquest of the comparatively populous maritime tracts from the Moors to be carried out independently of that of the eastern kingdoms, which were also well peopled. The absence of any such means of intercommunication as navigable rivers afford has favored the continuance of this isolation. The precise line of this western frontier is formed for a considerable length by portions of the chief rivers or by small tributaries, and on the north (between Portugal and Galicia) it is determined to a large extent by small mountain ranges. The British rock of Gibraltar, in the extreme south of the peninsula, is separated from Spain by a low isthmus known as the Neutral Ground.

The main water-parting of the peninsula is everywhere near the edge of the tableland on the north, east, and south, and hence describes a semicircle with the convexity to the east. The Ebro alone of the great rivers flows into the Mediterranean. The following table gives the length of the principal Iberian rivers, with the area of their basins—the length according to different authorities, the area of the basins according to Strelbitsky, whose measurements of area appear to be more trustworthy than those made by him of the length of rivers:

	Length in English Miles.			Area in Square Miles.
	Wagner.	Ritter.	Strelbitsky.	
Ebro..........	442	416	470	38,580
Duero (Douro).....	452	507	485	36,710
Tagus..............	565	553	566	31,865
Guadiana...........	510	490	316	25,300
Guadalquivir	337	350	374	21,580

The only considerable lakes in Spain are three coast lagoons—that of Albufera in the province of Valencia, the Mar Menor in Murcia, and the Laguna de la Janda in Cadiz behind Cape Trafalgar. Small alpine and other lakes are numerous, and small salt lakes are to be found in every steppe region.

The geological structure of the Spanish Peninsula is comparatively simple. Upon a fundamental platform of ancient crystalline rocks, which had previously been upraised into detached ridges, a series of sedimentary formations was laid down, among which occur representatives of most of the geological systems from the older Palæozoic rocks up to those of Quarternary date.

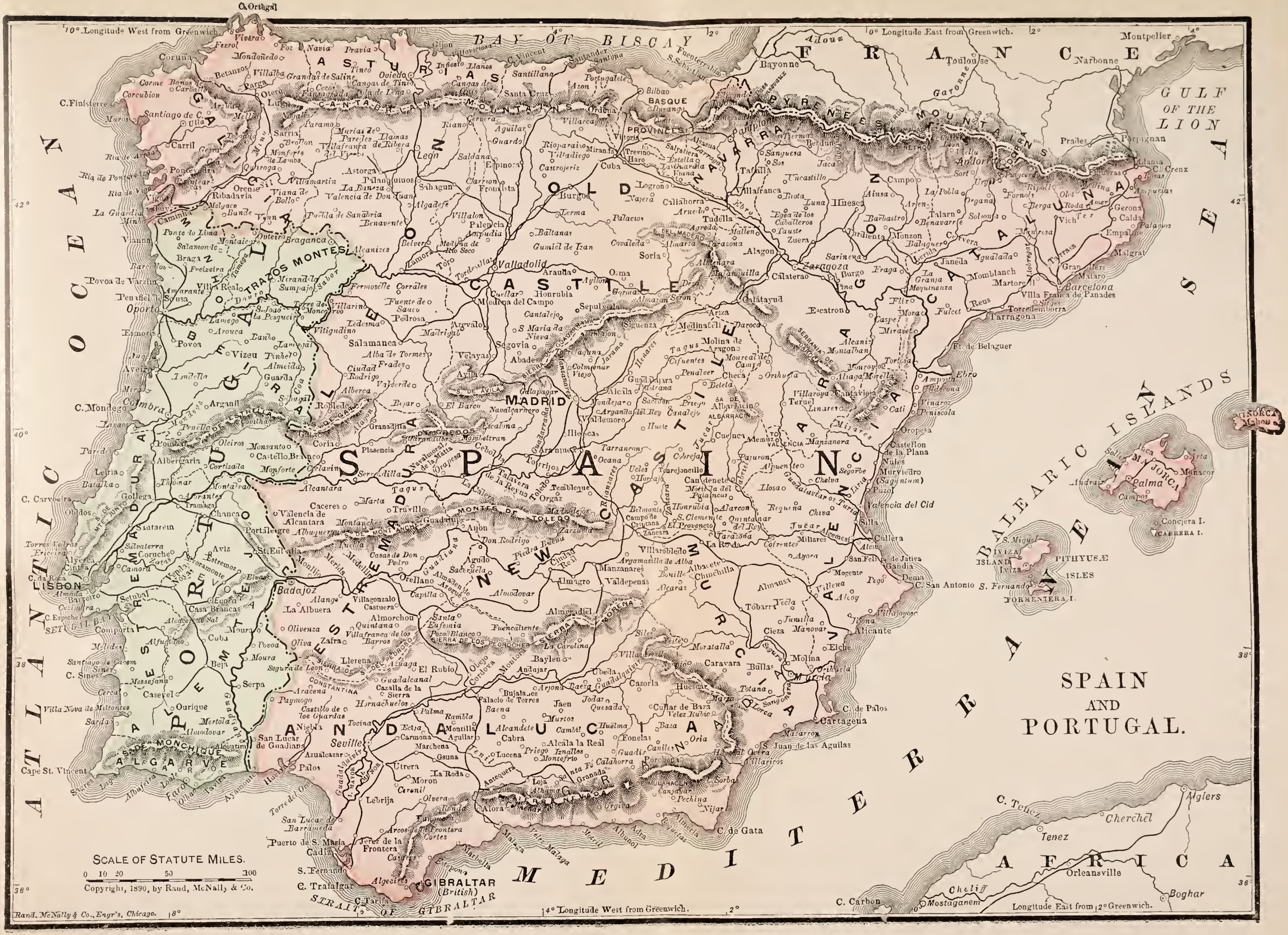
Climate.—In accordance with its southerly position, its differences of elevation, and the variety in its superficial configuration in other respects, Spain presents within its borders examples of every kind of climate to be found on the northern hemisphere, with the sole exception of that of the torrid zone. As regards temperature, the heart of the table-land is characterized by extremes as great as are to be met with in almost any part of central Europe. The northern and northwestern maritime provinces, on the other hand, have a climate as equable, and, it may be added, as moist, as that of the west of England or Scotland.

Vegetation.—The vegetation of Spain exhibits a variety in keeping with the differences of climate just described. The number of endemic species is exceptionally large, the number of monotypic genera in the peninsula greater than in any other part of the Mediterranean domain. The endemic species are naturally most numerous in the mountains, and above all in the loftiest ranges, the Pyrenees and the Sierra Nevada; but it is a peculiarity of the Spanish tableland, as compared with the plains and tablelands of central Europe, that it also possesses a considerable number of endemic plants and plants of extremely restricted range. This fact, however, is also in harmony with the physical conditions above described, being explained by the local varieties, not only of climate, but also of soil. Altogether no other country in Europe of equal extent has so great a wealth of species as Spain. According to the *Prodromus Floræ Hispanicæ* of Willkomm and Lange (completed in 1880), the number of species of vascular plants then ascertained to exist in the country was 5,096.

The forest area of Spain generally is relatively small. The whole extent of forests is estimated at little more than 3,000,000 of hectares (7,500,000 acres), or less than 6 per cent. of the area of the kingdom. Evergreen oaks, chestnuts and conifers are the prevailing trees. The cork oaks of the southern provinces and of Catalonia are of immense value, but the groves containing this tree have suffered greatly from the reckless way in which the product is collected. Among other characteristic trees are the Spanish pine (*Pinus hispanica*), Corsican pine (*P. Laricio*), Pinsapo fir (*Abies Pinsapo*), and the *Quercus Tozza*, the last belonging to the slopes of the Sierra Nevada. Besides the date palm the dwarf-palm grows spontaneously in some parts of the south, but it nowhere makes up a large element of the vegetation.

Fauna.—The Iberian Peninsula belongs to the Mediterranean subregion of the Palæarctic region of the animal kingdom, a division which includes also the north of Africa. The forms that betray African affinities are naturally to be found chiefly in the south. Among the mammals that fall under this head are the common genet (*Genetta vulgaris*), which extends, however, pretty far north, and is found also in the south of France, the fallow-deer, the porcupine (very rare), and a species of ichneumon (*Herpestes widdringtonii*), which is confined to the peninsula, and is the only European species of this characteristically African genus. The magot or Barbary ape (*Inuus ecaudatus*), the only species of monkey still found wild in Europe, is also a native of Spain, but the only flock still surviving, on the rock of Gibraltar, has often been on the point of extinction, and has to be renewed from time to time by importations from the north of Africa. Of the mammals in which Spain shows more affinity to the fauna of central and northern Europe, some of the most characteristic are the Spanish lynx (*Lynx pardinus*), a species confined to the peninsula, and the Spanish hare (*Lepus madritensis*). The birds of Spain are very numerous, partly, no doubt, in consequence of the fact that the peninsula lies in the route of those birds of passage which cross from Africa to Europe or Europe to Africa by way of the Straits of Gibraltar. Many species belonging to central Europe pass the winter in Spain, especially on the southeastern coasts and in the valley of the Guadalquivir. Innumerable, for example, are the snipes which in that season are killed in the latter district and brought to the market at Seville. Insect life is remarkably abundant and varied. More than 350 species of butterflies, many of them endemic, have been counted in the province of Madrid alone. Besides the ordinary European scorpion, which is generally distributed in southern Europe, there is another species, the sting of which is said to be still more severe, found chiefly in the basin of the Ebro. Trout abound in the mountain streams and lakes, barbel and many other species of *Cyprinidæ* in the rivers of the plains. For the sea fauna, see under *Fisheries* below.

Extent.—The total area of the mainland of Spain, according to the calculations of Strelbitsky, is 495,612 square kilometers or 191,365 square miles, that of the Balearic Islands 4,982 square kilometers or 1,923



SCALE OF STATUTE MILES.

0 10 20 50 100

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square miles, and that of the Canary Islands, which, though belonging geographically to Africa, are administratively associated with the kingdom of Spain, 7,611 square kilometers or 2,939 square miles; so that the total area of the kingdom is 508,205 square kilometers or 196,225 square miles.

Territorial Divisions and Population.—For administrative purposes the kingdom of Spain has since 1833 been divided into forty-nine provinces, forty-seven of which belong to the mainland. Before 1833 the mainland was divided into thirteen provinces, some large and some small, which took their names from the ancient kingdoms and principalities out of which the modern kingdom was gradually built up. The present provinces are subdivided into judicial districts (*partidos judiciales*) and communes (*ayuntamientos*).

It is probable that the population of Spain attained its highest development during the period of the early Roman empire, when it has been estimated, though of course on imperfect data, to have numbered 40,000,000 or 50,000,000. The best evidence of a dense population in those days is that afforded by the specific estimates of ancient writers for some of the larger cities. The population of Tarraco (Tarragona), was estimated at 2,500,000, and that of Nova Carthago (Cartagena), Italica (Sevilla la Vieja), and others at several hundreds of thousands. Emerita Augusta (Merida) had a Roman garrison of 90,000 men, which also implies a large population. The last census, that of 1887, gave a population of slightly over 20,000,000.

The first Spanish census was made in 1594, but some of the provinces now included in the kingdom were for one reason or another not embraced in the enumeration, so that the total population assigned to Spain within its present limits for that date is obtained by adding the results of enumerations at different dates in the provinces then excluded. The total thus arrived at is 8,206,791. No other census was taken till 1787, when the total was found to be 10,268,150; and this census was followed by another in 1797, when the population was returned as 10,541,221. Various estimates were made within the next sixty years, but the census of 1857 proved that some of these estimates must have been greatly below the truth. The total population then ascertained to exist in Spain was 15,464,340, an increase of not much less than 50 per cent. since the census of 1797.

As regards the distribution of population between town and country, Spain contrasts in a marked manner with Italy, Spain having but few large towns and a relatively large country population.

Foreign Possessions.—The population of the principal foreign possessions of Spain in 1887 numbered 8,542,300.

Besides Cuba and Porto Rico in the West Indies, and the Philippine Islands, Spain possesses the greater part of the Sulu Archipelago, and, in the Pacific, the Marianne, Pelew, and Caroline Islands. Off the Guinea coast she possesses the Island of Annobon, as well as that of Fernando Po, and on the coast itself the district round Corisco Bay. She has likewise declared a protectorate over the West African coast between Capes Bojador and Blanco (desert of Sahara).

Agriculture.—Agriculture is by far the most important Spanish industry. In general it is in a backward condition, and is now much less productive than in the time of the Romans and again under the Moors. The expulsion of the latter people in many places inflicted upon agriculture a blow from which it has not recovered to this day. Aragon and Estremadura, the two most thinly peopled of all the old provinces, and the eastern half of Andalusia (above Seville), have all suffered particularly in this manner, later occupiers never having been able to rival the Moors in overcoming the sterility of nature, as in Aragon, or in taking advantage of its fertility, as in Andalusia and the Tierra de Barros. The implements in general use are of the rudest description. The plow is merely a pointed stick shod with iron, crossed by another stick which serves as a share, scratching the ground to the depth of a few inches. But the regular import now of agricultural implements (chiefly from England and France) betokens an improvement in this respect. In general there has been considerable improvement in the condition of agriculture since the introduction of railways, and in every province there is a royal commissioner intrusted with the duty of supervising and encouraging this branch of industry. Among other institutions for the promotion of agriculture the royal central school at Aranjuez, to which is attached a model farm, is of special importance.

Cereals constitute the principal object of cultivation, and among these wheat ranks first, the next in importance being barley, the chief fodder of horses and mules. Both of these grains are cultivated in all parts—on the plains as well as among the mountains, but chiefly on the more level parts of the two Castiles and Leon, and on the plains of the basin of the Guadalquivir. Oats and rye are cultivated only in the higher parts of the mountains, the former as a substitute for barley in feeding horses and mules, the latter as a breadstuff. Maize also is cultivated in all the provinces; nevertheless the total extent of its cultivation is limited, since, being a summer crop, it requires irrigation except in the Atlantic provinces, and other products generally yield a more profitable return where irrigation is pursued. Rice is cultivated on a large scale only in Valencia. Among cereals of less importance are buckwheat (in the mountainous regions of the north), millets, including both the common millet (*Panicum miliaceum*) and the so-called Indian millet (*Sorghum vulgare*, the *joári* of India, the *durrah* of Africa), and even (in La Mancha) guinea-corn (*Penicillaria spicata*).

In the production of pod-fruits and kitchen vegetables Spain is ahead of all other countries in Europe.

As regards the quantity of the product wine comes next after cereals among the objects of cultivation in Spain. Here again we are dependent only upon vague estimates of the average amount produced, but usually the average annual Spanish production of wine is estimated at between 440,000,000 and 500,000,000 gallons, an estimate which places Spain third (next after France and Italy) among the wine producing countries of Europe.

There is also a large export of grapes and raisins, especially from the southern provinces (Malaga and Almeria). The average quantity of the two together exported is about 50,000,000 kilogrammes (110,000,000 pounds), the average value about $8,000,000. The vines whose fruit is intended for table use as grapes or raisins are trained on espaliers or on trees, especially the nettle-tree (*Celtis australis*).

Among fruit-trees the first place belongs to the olive, which is estimated to cover about 3 per cent. of the surface, and accordingly about an equal area to that occupied by the vine. Oranges, excluded from the plateau by the severity of the winter cold, are grown in great quantity on the plains of Andalusia and all round the Mediterranean coast; and figs, almonds, pomegranates, carobs, and other southern fruits are also grown abundantly in all the warmer parts, the first two even in central Spain and the more sheltered parts of the northern maritime provinces. In these last, however, the prevailing fruit-trees are those of central Europe, and above all the apple, which is very extensively cultivated in Asturias, the Basque Provinces, and Navarre. The date-palm is very general in the south-eastern half of the kingdom, but is cultivated for its fruit only in the province of Alicante, in which lies the celebrated date-grove of Elche.

The rearing of animals has likewise been receiving in recent years increased attention at the hands of both government and people, though here also we are without recent official statistics to show the consequent advance.

The only animals belonging to Spain still noted for their excellence are mules and asses, which are recognized as the best to be found anywhere. The quality of the horses has been greatly improved, however, since the establishment of government studs more than forty years ago.

Fisheries.—The catching of tunnies, sardines, anchovies, and salmon on the coasts employs large numbers of fishermen, and the salting, smoking, and packing of the first three give employment to many others. Spanish fishermen likewise dive for coral on the coasts of Andalusia and the north of Africa. The fishermen of Catalonia and Valencia have the greatest reputation for their skill. The center of the principal tunny fisheries of Spain is a small rocky islet called Cristina, about three leagues from the mouth of the Guadiana. The fishing lasts from May to August, that of sardines from August to the end of January.

Minerals.—The mineral resources of Spain are vast and varied, but are as yet far from being adequately turned to account. No European country produced so great a variety of minerals in large amount, and in the production of copper ore, lead ore, and quicksilver Spain heads the list. In the production of salt and silver it is excelled only by Austria-Hungary, and, as regards silver, not always even by it.

Manufactures.—At the census of 1877 only about 3 per cent. of the classified population was returned as engaged in manufacturing industries. The principal manufacture is that of cotton. Flax spinning and the manufacture of linen goods are pursued to a considerable extent in Galicia and Asturias. The silk industry, which is likewise of high importance, but inadequate to meet the home demand for silk fabrics, is chiefly centered in Valencia, next to which come Murcia and Seville. Metal industries are chiefly carried on in the Basque Provinces, where various articles in iron and copper are made. A royal factory for the making of artillery and other weapons of war exists at La Trubia, in Asturias. Toledo is still noted, as it has been from the earliest times, for the excellence of its sword-blades. The manufacture of leather, another Spanish industry of old renown, is still extensively carried on in Catalonia and elsewhere, but the making of *Cordwain* has long ceased to be a specialty of Cordova, from which it takes its name. Boots and shoes and other articles in leather form the only considerable export of manufactured goods. Gloves are made in great quantity in Madrid, shoes in the Balearic Islands. The paper industry is very flourishing, especially in Catalonia and Valencia. Esparto is twisted into cords and ropes, and plaited into a variety of other articles, in Murcia and Alicante and elsewhere. The refining of cane-sugar is largely carried on in Barcelona, Malaga, Almeria, and Granada, and the making of olive oil and brandy is general. So also is the making of charcoal, which in most parts of Spain takes the place of coal for all ordinary heating purposes, and even in some cases in mechanical industries. The large furnaces for the distillation of mercury at Almaden were at one time, if they are not still, heated solely with charcoal obtained from the *Cistus ladaniferus*. Among manufacturing industries of less importance are the making of porcelain (at the royal factory of Moncloa, near Madrid), glass and earthenware, soap, chocolate, and cork-stoppers. The manufacture of tobacco, which is a royal monopoly, is carried on at seven factories—at Seville, Madrid, Santander, Gijon, Coruña, Valencia, and Alicante—that of Seville being the largest.

Foreign Commerce.—Possessing such varied resources as it does, and being peculiarly favorably situated for commerce, Spain might be expected to take a leading place among the trading communities of Europe. This it did at one time hold, when the treasure acquired by the discovery of America and the conquest of Mexico and Peru was squandered in the purchase of various commodities from England, the Netherlands, and other countries. This period of outward prosperity, however, was also that in which the seeds of decline were planted. The expulsion of the Moors from Granada was contemporaneous with the discovery of the New World. Hundreds of thousands of Moors were driven out from the country on subsequent occasions, and in the act Spain lost the best of her agriculturists and handicraftsmen. For the stay-at-home industry by which the resources of the land could be developed as they had been by the Moors the Spaniards of that day had no taste. Excited by the hope of rapidly-acquired wealth and the love of adventure, the more enterprising spirits embarked upon a career of discovery, and agriculture and manufacturing industry fell into contempt. The mercantile supremacy of the country was thus short-lived. Political causes supervened to hasten the country's decline, and it is only within recent times, since the introduction of railways, that the commerce of the country has begun to revive.

The foreign commerce of Spain is chiefly carried on with the United Kingdom, France, Cuba, and the United States.

Shipping and Navigation.—Relatively to the extent of its coast-line and the number and excellence of its seaports (of which there are sixty on the Mediterranean coast, fifty-six on the Atlantic), the amount of shipping belonging to Spain is small. In 1884 the total registered tonnage was 524,000 tons, not much more than that of Sweden at the same date, and only about half that of Italy. The number of vessels was 1,803, including 301 steamers. Nearly half the transmarine imports (reckoned by value) and 58 per cent. of the transmarine exports were carried under a foreign flag.

Communication.—The communications in Spain have been greatly improved since the beginning of the present century. In 1808 there were little more than 500 miles of carriage roads, but now there are over 28,000. In the mountainous districts, where there are only narrow paths, frequently rather steep, it is still not uncommon to meet long trains of mules.

Railways have made great advance since the middle of the century. The oldest line is that from Barcelona to Mataro, seventeen and a half miles, which was opened on October 28, 1848. Of late years railway construction has been going on pretty rapidly. In 1880 the number of miles open for traffic was 4,645. All the Spanish railways belong to private companies, but most of them have obtained subventions from the government, to which most of the Spanish railways will revert at the end of a term of ninety-nine years. In granting a concession for a new railway the regular practice is to give it to whatever company offers to construct it with the lowest subvention.

The postal and telegraphic systems have been placed on the same footing as in other civilized countries.

Army and Navy.—Military (or naval) service is obligatory on all Spaniards, but in certain cases recruits are allowed to buy themselves off. According to the law of January 8, 1882, the period of service for all arms is twelve years, of which three years must be passed with the colors, three years in the active reserve, and six years in the second reserve. The minister of war is empowered, however, on financial grounds, to transfer troops serving with the colors to the active reserve before the period of three years' service has been fulfilled. Liability to service begins with the first day of the calendar year in which the twentieth year is completed. Persons holding a civil appointment or pursuing any handicraft independently are allowed to buy themselves off for 1,500 pesetas ($300), and brothers are allowed to take each others' place in service, or to exchange the numbers that have fallen to them by lot in the raising of the recruits for the year. For carrying out the law Spain is divided into fourteen military districts, the boundaries of which do not at all coincide with those of provinces.

The actual strength of the regular army is fixed at about 94,000 men for the kingdom (including the Balearic and Canary Islands), but this number may be brought up to 400,000 in time of war. The strength of the regular army in Cuba is about 22,500 men, in Porto Rico about 3,200, and on the Philippine Islands about 8,200. The active army is divided into 140 battalions, besides the same number of depot and reserve battalions; 24 cavalry regiments, and the same number of depot squadrons and reserve cavalry regiments; 9 regiments of field artillery, and 3 of mounted artillery, besides 6 reserve regiments of artillery, and 10 battalions of engineers. There are also 13 battalions of fortress artillery.

The following statement shows the strength of the navy in 1885:—*First Class*—4 ironclad frigates (55 guns), 4 screw frigates (97 guns), 6 cruisers (48 guns); *Second Class*—5 frigates (104 guns), 3 cruisers, 12 corvettes and troopships (39 guns); *Third Class*—1 ironclad monitor (3 guns), 1 floating battery, 79 gunboats, transports, etc. (124 guns). In 1889 the navy consisted of 126 steam vessels (7 of which were ironclads) and 22,000 men.

The navy is manned by conscription in the maritime districts. In 1885 the number of seamen was about 14,000, that of marines about 7,000.

Religion.—Roman Catholicism is the established religion, and the church and clergy are maintained by the state. The immense majority of the people are professed adherents of this faith, so that, so far as numbers go, Spain is still the most "Catholic" country in the world, as it has long been styled.

Education.—By the law of July 17, 1857, primary education was declared compulsory on all children of school age (originally fixed at six to nine) and made free to the poor, but the results of the census, though showing an advance in elementary education as compared with previous years, makes it clear that this law is far from being efficiently carried out.

There are ten universities—those of Madrid (founded in 1836 to replace the long-celebrated university of Alcala), Barcelona, Granada, Salamanca, Seville, Valencia, Santiago, Saragossa, Valladolid, and Oviedo; that of Madrid is now the most celebrated and the best attended, while that of Salamanca, so renowned in the Middle Ages, is now in least repute.

Political Administration.—Spain is an hereditary monarchy, the constitution of which rests on the fundamental law of June 30, 1876. The sovereign becomes of age on completing his or her sixteenth year. The sovereign is grand-master of the eight Spanish orders of knighthood, the principal of which is that of the Golden Fleece (Toison de Oro), founded in 1431, by Philip of Burgundy. The chain of this order surrounds the royal arms, in which are included, besides the arms of Castile, Leon, Granada, and the lilies of the royal house of Bourbon, the arms of Austria, Sicily, Savoy, Brabant, and others. The national colors are red and yellow. The flag is divided into three horizontal stripes—two red stripes, with a yellow one between bearing the royal arms.

The legislative authority is exercised by the sovereign in conjunction with the *cortes*, a body composed of two houses—a senate and a chamber of deputies. The senate is composed of members of three classes:—(1) members by right of birth or office—princes, the wealthier nobles holding the rank of grandee (*grande*), a dignity conferred by the king either for life or as an hereditary honor, and the highest state officials; (2) members nominated by the king for life; and (3) members elected by the state corporations and by the most highly taxed subjects of the state for a period of five years. The members belonging to the first two classes must not exceed 180 in number, and there may be the same number of members of the third class. The chamber of deputies consists of members elected for five years, in the proportion of one deputy for every 50,000 of the population. The electors must be twenty-five years of age and must have paid land-tax of twenty-five pesetas ($5) for one year, or an industrial tax of fifty pesetas for two years.

The executive administration is intrusted to a responsible ministry (*consejo de ministros*), in which the presidency belongs either to one of the ministers or to a president without portfolio. There are eight ministerial departments—the first secretaryship of state, to which belongs the management of foreign affairs, the secretaryships of grace and justice, finance, and the interior, the department for the promotion of material and intellectual interests (*secretaria de fomento*), and the secretaryships of war, marine, and the colonies.

The civil administration is under the secretary for the interior. In each province is a civil governor nominated by the crown, and the governor presides over a council, the members of which are elected by the representatives of each commune (*ayuntamiento*).

Ancient History.—Hispania was the name by which the Romans called the great peninsula made up of Spain and Portugal, but we know nothing certain as to the origin of the name, or whether it was in general use among the ancient inhabitants of the country.

To the Greeks Spain, or rather its coast-line on the Mediterranean, was known vaguely as Iberia, a name we meet with in Herodotus (i. 163) in connection with the Phœnican Tartessus. The Greeks seem to have planted no colonies in Spain, with the exception of Emporium, on the coast just under the eastern spur of the Pyrenees, founded probably from Massilia (Marseilles) by the Phocæans, and perhaps of Saguntum. In fact they had but very hazy notions about the country, and Iberia, as they called it, was to them little more than a name for an indefinite extent of territory in the Far West, in the occupation of barbarous Celts and Iberians, with some Phœnician settlements for the purposes of trade on its southern coasts. Tarraco, one of the oldest and most important of the cities of Spain, and one of which we hear continually in the subsequent history of the country, was also in all probability a Phœnician colony. Gades, Tartessus, Tarraco, all seem to have been of Phœnician origin and of unknown antiquity, and they were flourishing places in the seventh century B.C., when the Greeks first made a slight acquaintance with them—an acquaintance, however, which they did not follow up. The result is that we really know nothing about Spain till the first war between Rome and Carthage, (264–241 B.C.)

There must have been a good deal of Phœnician blood in the South of Spain for many centuries, and this no doubt prepared the way for Carthaginian ascendancy in the country. Not, however, till after the First Punic War and the loss of Sicily was there anything that could be called a Carthaginian empire in Spain. It was in 237 B.C. that Hamilcar Barca, the father of Hannibal, crossed the Straits of Gibraltar and set foot in Spain, not, however, with any commission from the home government at Carthage; but with the deliberately formed design of making the country, with its warlike population and great mineral wealth, into a Carthaginian province, and ultimately into a basis of operations in a future war with Rome (see HAMILCAR, HASDRUBAL, HANNIBAL). His successor, Hannibal, after two years' continuous fighting, which resulted in the submission of hitherto unconquered tribes and the undisputed supremacy of Carthage throughout almost all Spain, attacked and took the place in 218.

This was the beginning of the Second Punic War: Spain was now for the first time entered by Roman armies, under the command of the two Scipios—the brothers Cneius and Publius. Six years of hard fighting ended in the defeat and death of these two brave men, but in 210 the son of Publius, the elder Africanus, struck a decisive blow at the Carthaginian power in Spain by the sudden capture of New Carthage. The war, however, still dragged on till 205, in which year it may be said that Spain, or at least that part of it which had been under Carthage, was fairly conquered by the arms of Rome.

In 195 the elder Cato had to put down a rising in the country, in which the Celtiberi took the lead, but he offered them favorable terms, and showed himself particularly anxious to conciliate them. Some few years afterward, in 179 and 178, we find the father of the famous Gracchi governor of Hither Spain, and fighting with the troublesome Celtiberi, winning victories over them, capturing 103 of their towns, and then securing his conquests by showing himself as great in peace as he had been in war. After this period there were successive risings, until at last the younger Scipio was sent into the country and succeeded in conquering the unruly tribes. The Province of Hither Spain was rendered safe from Celtiberian incursions. Shortly afterward Lusitania and its towns, after some obstinate fighting, were reduced to submission by the consul Junius Brutus, and thus Spain, with the exception of its northern coasts, the home of its most barbarous tribes, was nominally Roman territory.

Again in 97 and 96 we hear of a rising of these same Celtiberians against Rome, and of campaigns in the interior, in which for the first time we meet the name of the famous Sertorius, a name almost as conspicuous in ancient Spanish history as that of Hamilcar or Hannibal. It was to his skill in winning the hearts of the Spaniards, more even than to his very considerable military ability, that he owed his success. By the year 71 the country had been reconquered by Pompey for Rome, and the two provinces of Hither and Further Spain were reorganized under a somewhat more stringent rule, the tribute in some districts of the latter province being raised, and some of the towns in both losing their municipal independence. In 61 the great Cæsar was governor of Further Spain, and carried the arms of Rome into the imperfectly conquered regions of the west and northwest, the country of the Lusitanians and of the Gallæci, and with a fleet from Gades, is said to have occupied a point in the northwest answering to Coruña. But he was too short a time in Spain to reduce these barbarous regions to permanent subjection, and the work still remained to be accomplished. In the civil war with Pompey in 49 he was in Hither Spain, winning decisive victories over Pompey's generals, Afranius and Petreius. Once more, in 45, he had to enter Further Spain at the head of an army, and to defeat his rival's sons at Munda, somewhere probably in the neighborhood of Cordova, a victory which made him undisputed master of the Roman world. Spain, however, the northern part at least, was not thoroughly subdued—"pacified," in Roman phrase—till the reign of Augustus, whose ambition it was to advance the boundaries of empire to the ocean.

Under the empire Spain was divided for the general purposes included under the head of local administration into fourteen "conventus," that is, provincial parliaments or assemblies made up of a union or combination of so many communities or townships. The town or city which was the center of each "conventus" was the place where justice was administered to the inhabitants of the district, and would, so far, answer to our assize-town. The provincial constitution of Spain was revised and modified to some extent in the second century in the time, it would seem, of the Antonines and Hadrian.

Spain in 256 A.D. was invaded and ravaged by the Franks; Tarraco was almost destroyed, and several flourishing towns reduced to mere villages. It was, however, but a passing storm—the only interruption, in fact, to the peace and prosperity of the country during 400 years. In 409, however, the year of the sack of Rome under Alaric, a tide of barbarism swept over the country; Suevi, Alani, Vandals "ravaged," says a writer of the time, quoted by Gibbon (ch. 31), "with equal fury the cities and the open country." Spain, long so quiet and prosperous, was brought down to the lowest depth of misery. At this point the precise order of events is not quite clearly ascertainable. It seems that in 414 or 415 a Visigothic host entered Spain under their king, Ataulphus. To Ataulphus, who was murdered at his new capital Barcelona, succeeded after a brief interval in 415 Walia, a warlike and ambitious chief, who may be said to have established the Visigothic or West-Gothic kingdom in Spain on the ruins of the old Roman province.

Spain under the West-Goths.—The West-Gothic or Visigothic kingdom in Spain, founded by Walia, lasted for nearly three centuries, from 418 to 711, when it fell before the Arab or Saracen invasion. Toulouse was its headquarters; here was held the court of the West-Gothic kings, while Toledo became the center of administration for Spain. The relations of the West-Goths with Rome varied from time to time: sometimes they were her friendly allies, sometimes, nominally at least, her dependents; sometimes they rose in revolt and were her open enemies.

Among the most conspicuous features of the West-Gothic kingdom in Spain we may note elective monarchy, the great and indeed overshadowing power of the church, an aristocracy which had in its hands a very large part of the administration, a uniform code of laws for all Spaniards, with both a distinctly Roman and ecclesiastical impress on it. The church on the whole seems to have been the guiding spirit, and the Spanish bishops and clergy were held in high esteem for their learning and virtue.

In anything like general literature Spain seems to have been decidedly poor during this period, while among her neighbors in the south of Gaul Greek philosophy was a fashionable study, testifying to the presence of considerable intellectual activity. Spain under its West-Gothic kings and its Catholic clergy may have been a fairly well governed country, but long before the end came there must have been languor and decay among its people. By the end of the seventh century northern Africa to the Straits of Gibraltar had passed wholly under Saracenic dominion. The struggle had been long and hard, and the West-Gothic kings, who had recovered the towns on the southern coasts, and even made some small conquests on the African shores, had done something to prolong it; but in 710 a little band of Saracens landed unopposed at Gibraltar, returned in safety, and urged their brethren at once to cross the straits and take possession of the country. In the following year (711) Tárik, at the head of about 5,000 Saracen volunteers, entered Spain. A great Gothic army under Roderick, "the last of the Goths," was routed in the neighborhod of Xeres on the Guadalete, and the Arab or Saracenic conquest of Spain, with the exception of the mountainous districts of the north, was accomplished with amazing ease and rapidity. Anything like a vigorous national resistance seems to have been too much for the Spaniards, enervated as they were by long familiarity with Roman civilization.

Mediæval History.—The Arab invasion of Spain had been intended by Músá, the governor of Africa, to be merely a plundering raid. A single unexpected success turned it into a conquest. Tárik had already made himself master of Cordova and Toledo when Músá arrived from Africa and rewarded his too successful lieutenant by consigning him to prison. But his military ability was too valuable to be dispensed with, and he was speedily released to aid in completing the conquest. Within four years the whole peninsula, except the mountainous districts in the north, had submitted to the invaders.

As time went on, and the Arabs felt more secure in their position, their rule became not unnaturally harsher. Many of the treaties which had secured favorable terms to the conquered were broken, and the Christians were provoked to resistance by persecution. A notable instance of this was the edict making circumcision compulsory for Christians as well as Moslems. Greater hardships still were endured by the "renegades," most of whom had embraced Mohammedanism from a desire for safety or for temporal gain, and who found that return to the old faith was blocked both to themselves and to their children by the law which punished a perverted Mussulman with death. At the same time their social position was intolerable, and they were excluded from all lucrative offices and from all share in the government. Their discontent led to numerous and stubborn rebellions, but they belong to a later period, and in the eighth century the chroniclers record only a single rising, that of the Christians of Beja, and they seem to have been merely the tools of an ambitious Arab chieftain.

It was fortunate for the Arabs that they succeeded at first in conciliating the natives, as otherwise their rule in the peninsula would have been short-lived. Internal discord offered the Christians an easy opportunity for successful revolt if they had chosen to avail themselves of it. The first forty years of Arab rule in Spain are a period of woeful confusion, and it is difficult even to enumerate the names of the emirs who followed each other in rapid succession. The great empire of the Arabs began to fall to pieces as soon as it had reached its greatest extent. The Arabs were unable to live at peace, and the one means of preventing them from warring with each other was to find them new lands to conquer. Hence came the frequent invasions of Gaul, now ruled by the degenerate Merwings, which resulted in the conquest of the provinces of Septimania and Narbonne, and at one time threatened to subject the whole of western Europe to the successor of Mohammed. But the battles of Toulouse (721) and of Tours (732) checked the advance of the Moslems, and by 759 they had been compelled to retire from all possessions beyond the Pyrenees. Thus thrown back upon the peninsula, it seemed probable that their empire in Spain would speedily succumb to the disruptive forces which had no longer any external outlet.

From this fate the Arab power was saved by 'Abd al-Rahmán (Abderane), the one survivor of the Omayyad dynasty, who succeeded after a long series of romantic adventures in escaping from the general massacre of his family. His arrival in the peninsula was welcomed by those Arab chieftains who had ends of their own to gain or who saw how impossible it was for Spain to be ruled from a distant center like Damascus or Bagdad. The resistance of the Abbasid emirs, Yúsuf and 'Alí b. Moghíth, was overcome, and 'Abd al-Rahmán was enabled to found a new Omayyad dynasty at Cordova. He and his immediate successors seem to have contented themselves with the title of emir, but all connection with the eastern caliphate was cut off, and Spain became independent under its new rulers. A formidable rising of the sons of Yúsuf was put down in 786, and 'Abd al-Rahmán was enabled to devote the last two years of his life to the arts of peace and to the construction of his famous mosque at Cordova. Before his death he settled the succession on his third son, Hishám, who had been born in Spain, and compelled his followers and his elder sons to swear fealty.

Hishám's reign, which lasted only eight years (788-796), was comparatively uneventful. His son and successor, Al-Hakam, was of a very different temperament. With a keen enjoyment of the pleasures of life, Al-Hakam disregarded the precepts of the Koran which forbade the use of wine, and his lax practices irritated the *fakíhs*, the "scribes" of Mohammedanism. The inability of the Arabs to adapt themselves to a life of peace found expression in a number of isolated risings, of which the most notable took place in Toledo and Cordova. The inhabitants of Toledo had never forgotten that their city had once been the capital of Spain, and most of them belonged to the class of "renegades" who had no real attachment to the dominant faith. Al-Hakam determined to suppress their discontent by a notable act of cruel treachery. Feigning the most complete goodwill, he invited the chief citizens to a banquet in honor of the presence of his son in Toledo. As they entered the door they were conducted to an inner chamber and massacred by a band of assassins. More than seven hundred are said to have perished on this "day of the fosse" (807), and the citizens, deprived of their leaders, submitted with the torpor of despair. The fate of Toledo terrified the Cordovans, and postponed their rising for seven years. But in 814 the murder of a blacksmith by one of Al-Hakam's bodyguard provoked a terrible outbreak. Besieged in his palace by the infuriated mob, Al-Hakam only escaped death by his own coolness and presence of mind. A detachment of his guard was sent to fire the houses of the citizens; the mob hurried off to save their families and goods; and a sudden charge of the emir and his soldiers threw them into complete disorder. With politic severity Al-Hakam destroyed a whole quarter of the city and condemned all the inhabitants to exile. Part of them found a new home in Africa, but others, after a temporary sojourn in Alexandria, conquered Crete, where they founded a dynasty, which lasted till 961, when the island was recovered by the Greeks. The *fakíhs*, the real instigators of the rebellion, were treated with conspicuous leniency, and their leader, Talút, was even admitted to Al-Hakam's favor.

By the end of the eighth century it had become evident that the Arabs had committed a great error in not reducing the whole peninsula, and that the contemptuous indifference with which they had left the northern mountains to a handful of refugees was destined to bring its own punishment. The formation of a Christian kingdom was the work of Alfonso I. Alfonso's son and successor, Fruela I. (765–775), fixed his capital at Oviedo, but the greater part of his reign was occupied with the suppression of internal disorders, and he ultimately fell a victim to assassination. His throne was successfully usurped by his cousin Aurelia and his nephew Silo. On the death of Silo (784) a party among the nobles elected Fruela's son, Alfonso II., but for six years the western half of the kingdom obeyed a bastard son of Alfonso I. by a Moorish captive, nicknamed from his origin El Maurecato. Under Alfonso the Chaste, whose long reign lasted till 842, the Christian kingdom of Oviedo was firmly established.

Alfonso II.'s reign witnessed the establishment of another Christian state in Spain. Charles the Great had been too much occupied elsewhere to avenge the great disaster at Roncesvalles, but he was only waiting for his opportunity. This was offered in 800 by the treachery of another governor of Saragossa, who had revolted against Al-Hakam and sought assistance from the Franks. Charles himself was on his way to Italy to assume the imperial crown, but he sent his son, Louis, across the Pyrenees. In his first campaign Louis reached the Ebro, but he had to return in 801 to vanquish the obstinate resistance of Barcelona. The administration of the "Spanish mark" was intrusted to Bera, a man of Gothic descent, who proved fully capable of the task imposed upon him. The attacks of the Arabs were repulsed, and their last possessions beyond the Ebro were lost in 811, when Tortosa, after a siege of two years, succumbed to the forces which Louis the Pious had again led over the mountains. Henceforth the province was ruled by the counts of Barcelona, as representatives of the Frankish kings.

The county of Barcelona may be dismissed with a few words. It continued for some time to be subject to Frankish suzerainty, and it suffered from the disorders that followed the break-up of Charles the Great's empire. With its mixed population and its long line of coast the county of Barcelona, or Catalonia, as it came to be called, was more involved in the affairs of Gaul than of Spain.

The history of Oviedo is more important and more complicated. Alfonso II.'s successors, Ramiro I. (842–850) and Ordoño I. (850–866), had to contend both with the great nobles, who aimed at independence, and with the Basques, who had never learned to submit to orderly rule. Alfonso III., in a long reign of nearly fifty years (866–910), won the title of "The Great" from the success which attended his arms. While his plundering raids extended as far as Coimbra and Lisbon, he really advanced his frontiers to the Douro, and, in order to defend these more exposed territories, he transferred his capital from Oviedo to Leon, on the further side of the mountains. In accordance with the universal custom of the Germans, Alfonso divided his territories among his three sons, Garcia receiving the southern districts with Leon as a capital, Ordono II. western Galicia, and Fruela II. the original district round Oviedo. In 931, however, the kingdom was again united under Ramiro II., a son of Ordoño II., and henceforth called after the new capital, Leon. Under Ramiro, a great warrior against the Arabs, we first hear of a district that was destined to become the most important in Spain. The border territory, a march to the southeast of Leon, previously Bardulia, was now known as Castile, from the number of castles that had been raised to hold it against the infidels. Its count, Fernan Gonzales, was the most powerful noble in the kingdom of Leon, and sought to make himself independent. Ramiro reduced him to submission, and then bound him to his side by marrying his eldest son to the count's daughter. Ordoño III. (950–957) sought to emulate his father's achievements against the Arabs, but was hampered by the revolt of his brother Sancho and his father-in-law, Fernan Gonzales. Sancho I. (957–966) found an enemy in his recent ally, who attempted to place a rival king upon the throne, and he could only procure restoration to his kingdom by an alliance with the caliph of Cordova. This alliance lasted during the minority of his son, Ramiro III. (966–982), who was deposed by the malcontent nobles in favor of his uncle, Bermudo II. (982–999). The latter, too mild a ruler for such troubled times, had a hard struggle against domestic treachery and foreign enemies, and left a desolate kingdom to his son Alfonso V. Alfonso succeeded in restoring order, and to his reign are attributed the most important of the *fueros*, on which were based the local institutions of his kingdom.

Meanwhile a new kingdom had sprung up to the east of Leon, which for a time seemed likely to become the chief state of Christian Spain. The district in the western Pyrenees bordering on the Bay of Biscay was the most defensible position in the peninsula. It was there that the Basques had held out against the German invaders, and that the Suevi had found a refuge from the Visigoths. The sovereignty of the Moslems and of the Franks had been in turn acknowledged, but had never been more than nominal. About the beginning of the tenth century Sancho founded here the kingdom of Navarre, and he succeeded in extending his rule as far as the lower Ebro. More important still were his acquisitions in the southeast of Navarre. Partly by marriage connections and partly by the sword, he obtained possession of the counties of Aragon, Sobrarbe, and Ribagorça, which had for years been struggling to maintain their independence against the Mussulman governor of Saragossa. These considerable territories Sancho divided on his death (1035) among his four sons, and the division is an important event in the history of Spain. Garcia, the eldest, received Navarre, with a small district on the right bank of the Ebro; Ferdinand, the second son, obtained Castile, with the addition of the district of Palencia, which had been wrested from Leon; the counties of Ribagorça and Sobrarbe passed to Gonzalo, and that of Aragon to Ramiro, a bastard.

The death of Sancho the Great seemed to offer Bermudo III. an opportunity for recovering his lost territories, and he at once collected his forces to attack Ferdinand. In a pitched battle near the river Carrion, Bermudo was defeated and killed, and the conqueror at once annexed Leon with its dependencies—Galicia and Asturias—to his new kingdom of Castile (1037). The eldest brother Garcia, resented a change which threatened to deprive Navarre of the preëminence which it had enjoyed under his father. To gratify his jealousy he did not scruple to ally himself with the emirs of Saragossa and Tudela. But in the battle of Atapuerca (1054) the unnatural coalition was defeated, Garcia lost his life on the field, and Ferdinand added to Castile the district on the right of the Ebro, leaving the rest of Navarre to his nephew, Sancho IV. Meanwhile Ramiro, equally ambitious and successful, got rid of his brother Gonzales, and seized upon Sobrarbe and Ribagorça to form, with his own inheritance, the kingdom of Aragon. Henceforth the history of Christian Spain centers round the two great states of Castile and Aragon. Leon, much to the disgust of its inhabitants, becomes a province of the former, and Navarre is soon afterward deprived of independence by its more powerful neighbor.

We must now return to the history of the Arabs. Under 'Abd al-Rahmán II. (822–852), one of the mildest and most cultivated of the Omayyad dynasty, began a period of disorder and anarchy which might have ruined his power if the northern states had been prepared to take advantage of it. Mohammed (852-866), sterner and more narrow-minded than his predecessor, was not unwilling to take repressive measures. But the movement had succeeded in provoking a feeling of distrust between the two religions, and it was difficult to return to the old attitude of easy tolerance. The "renegades" found their position altered for the worse, and under Mohammed they were jealously excluded from all the higher offices of state. A series of revolts showed how prevalent was the feeling of discontent.

The premature death of Mondhir (the successor of Mohammed), a brave and chivalrous prince, gave the succession to his brother 'Abdallah (888–902), who ascended the throne at a very critical moment. Not only had the rising of the Christians and renegades assumed an almost national character, but the Arab nobles had taken advantage of the general disorder to assume the independence that was so congenial to them.

From this time till 1025 the history of Moslem Spain is but a record of internecine strife. The Omayyads were beset by enemies on all sides, and the throne was disputed by the Hammudites, sometimes a member of one dynasty and then one of the other occupying the throne. The last Caliph was an Omayyad, Hishám III. In 1031 he abdicated a title which had ceased to have any meaning, and sought peace and retirement in the neighborhood of Saragossa. His death five years later was almost unnoticed even in Cordova. With him ended the Omayyad dynasty, which had ruled in Spain for nearly three centuries, and which had produced princes worthy to be ranked with the greatest of their contemporaries. Its decline dates from the time when it allowed power to slip from its hands and to be wielded by ambitious ministers.

Ever since the death of Almansór in 1002 Moslem Spain had been gradually splitting up into a number of independent principalities. With the extinction of the Omayyads the last semblance of unity disappeared.

It was of additional moment that this disruption of the Mussulman power was contemporary with the formation of the great Christian states of Aragon and Castile. They were not slow to profit by the opportunity held out to them. It was in this century that the Christian cause found a champion in the famous Ruy Diaz Campeador, who under the name of "The Cid" became the traditional hero of Spanish mediæval history. Ferdinand I. of Castile (1037–1067) captured the strong places of Viseu, Lamego, and Coimbra, and was only diverted from the conquest of Toledo by the humble submission of the emir, who undertook to pay tribute to the Christian king. The unfortunate division of his territories between his three sons gave occasion to civil wars, which were only terminated in 1072 by the reunion of the whole kingdom under Alfonso VI. Following up his father's successes, Alfonso made himself master of Toledo, which once more became the capital of a Christian state. Meanwhile Ramiro I. of Aragon (1035–1063) drove the Moors from their last possessions in the counties of Aragon and Sobrarbe. His son, Sancho Ramirez (1063–1094), joined Alfonso VI. in an attack on Navarre which resulted in the partition of that state between the two kings, and commenced a war against the emir of Saragossa which ended, under his successors Pedro (1094–1104) and Alfonso I. (1104–1136), in the conquest of Huesca and Saragossa. The latter town became henceforth the recognized capital of Aragon.

This period is also important in another aspect. Hitherto the Christian kingdoms of Spain had been naturally isolated from the rest of Europe. But the papacy, under the guiding hand of Hildebrand (Gregory VII.), was now making its ecclesiastical supremacy a reality, and was not likely to tolerate independence even in the most distant members of the church. Aragon, which lay nearest to the other states of Western Christendom, made little difficulty about complying with the papal demands. Ramiro not only agreed to adopt the Roman ritual in his kingdom, but even sent tribute to Alexander II. Castile, lying farther distant, was more inclined to resent dictation. At a council at Burgos (1077) it was formally decided to retain the Gothic ritual. But Alfonso VI. realized the danger of isolating his state from the rest of Europe, and of his own accord conceded the demands of Gregory VII. From this time Christian Spain was directly connected with Rome, and became the most faithful, if not the most servile, of Roman Catholic countries.

The Christian victories of the eleventh century seemed likely at one time to annihilate the Mohammedan power in Spain. From this fate, however, it was saved, not by any internal strength, but by the arrival of assistance from Africa. The emir of Seville, Al-Mo'tamid, the most powerful of the Moslem princes, watched with profound misgiving the progress of the Castilian arms. When Toledo fell before Alfonso VI. he determined to appeal to Yúsuf b. Táshufín, the king of the Almoravids—a confederation of Berber sectaries that had recently established a vast empire reaching from the Senegal to Algiers. Yúsuf, who had established his capital at Morocco in 1069, was at this time eighty years of age, but he did not hesitate to accept the prospect of a new field of conquest and adventure. In 1086 he sailed from Ceuta to Algesiras, the cession of which he had demanded as the price of his aid, and was at once joined by the forces of the emirs of Andalusia. Alfonso VI. hastened to obtain assistance from the king of Aragon and the count of Barcelona, and with a larger force than had ever before been assembled in the Christian cause he met the Moors in the battle of Zalláka (Sacralias), a few miles from Badajoz (October, 1086). After an obstinate struggle victory declared for the infidels, and Alfonso had great difficulty in escaping with his life. Luckily for the Castilians, Yúsuf was recalled to Africa by the death of his eldest son, whom he had left at Ceuta, and his victory, which might have been as decisive as that of Tárik, was not followed up. In the course of a few years the whole of Moslem Spain was reunited under the king of Morocco, and the death of the Cid in 1099 enabled the Moors to recover Valencia, which he had taken in 1094. This was the last event of the reign of Yúsuf, who in 1103 handed over the government to his son 'Alí and returned to Africa, where he died three years later at the ripe age of 100 years.

Alfonso VI. of Castile had raised his kingdom to such preëminence in the peninsula, that he had assumed the title of "emperor of Spain." But a great disaster clouded his later years. In 1108 his only son, Sancho, perished with the flower of the Castilian chivalry on the fatal field of Ucles, and most of Alfonso's conquests passed into the hands of the victorious 'Alí.

The main interest of Spanish history in the thirteenth century centers round the war against the Moors, which was beginning to attract the interest and assistance of the other European states. It was the age of the great crusades, and Christendom was absorbed in the struggle against the infidel, both in the East and West. Spain, like Palestine, had its crusading orders, which vied with the Templars and Hospitallers both in wealth and military distinction. The order of Calatrava was founded in 1158, that of St. James of Compostella in 1175, and the order of Alcantara in 1176. The kingdom of Portugal, which had risen with great rapidity in the twelfth century, had a no less distinguished order, that of Evora. These military priests, debarred by their profession from the ordinary interests of humanity, gave a firmness and consistency to the Christian cause which had too often been sacrificed to the dynastic quarrels of the temporal princes.

The empire of the Almoravids, like so many of its predecessors, had soon begun to fall to pieces. It was too large and unwieldy for permanence. Its real center was at Morocco, and the attention of the caliphs was absorbed in the affairs of Africa, while the extortion and misgovernment of their viceroys excited discontent among the Mohammedans of Spain. This state of things gave a great advantage to Alfonso VII. of Castile, who revived the title of emperor of Spain, allied himself with Raymond Berengar of Barcelona and Aragon, and sought to emulate the achievements of his grandfather. For the second time the Moorish power in Spain was only saved from dissolution by the arrival of reënforcements from Africa. As happened so often in Mussulman history, a movement which began with religious reform ended with the formation of an empire. Mohammed b. ‘Abdallah, an Arab from Mount Atlas, gave himself out as the expected Mahdí, and formed a sect known as the Almohades (Unitarians). His disciple, ‘Abd al-Mu’min, was chosen as his successor, and soon overthrew the power of the Almoravids. Táshufín, ‘Alî’s son, made a vigorous but ineffectual resistance, and the conqueror crossed the sea to complete his work by the reduction of Spain (1146). The success of ‘Abd al-Mu’min, if less rapid than that of Yúsuf, was quite as complete. The Almoravids appealed to the Christians, and both Castile and Aragon came to their aid. Alfonso VII., with the help of the Genoese and Pisan fleets, besieged and took Almeria, while Raymond Berengar captured Tortosa. But these successes were only temporary. In ten years the Almoravids had been driven from the mainland, and only a small remnant found refuge in the Balearic Islands. Almeria was again wrested from the Castilians, and in 1157 Alfonso VII. died, the last of the series of “emperors of Spain.”

Luckily for the Christians Ya‘kúb, the most formidable opponent they had had to face since the great Almansór, died in 1199, and his death was followed by a rising of the Almoravids which took five years to suppress. Meanwhile successful efforts had been made by the pope and clergy to arrange the differences among the Christian states, and a confederation was formed between the five kings of Castile, Aragon, Leon, Navarre, and Portugal. When Ya‘kúb’s successor, Mohammed al-Násir, had succeeded in restoring order in Andalusia and prepared to march against the Christians, he was confronted by the allies in the famous battle of Las Navas de Tolosa, in the Sierra Morena (July 16, 1212). After an obstinate struggle the Christians gained a decisive victory, and their success decided the fate of Spain. The religious impulse which had constituted the original strength of the Almohades had come to an end; they were regarded as infidels by the orthodox Moslems, and the first failure necessarily led to their downfall.

After the fall of the Almohades the triumphs of the Christian arms were rapid and decisive. The separation of Castile and Leon, which had been productive of so much disaster, was finally terminated in 1230 by the accession of Ferdinand III., the son of Alfonso IX. of Leon and Berengaria of Castile. The province of Estremadura had been annexed to Leon by Alfonso IX., and now formed part of the united kingdom which under Ferdinand III. rapidly extended itself southward. In 1233 the Castilian army won a great victory over the Moors under Al-Motawakkil, and three years later Ferdinand himself captured Cordova, so long the capital of the Mohammedan rulers and one of the most wealthy and beautiful cities of Europe. In 1237 Al-Motawakkil was assassinated, and with him perished the last semblance of Moorish unity. The numerous emirs became independent rulers, and the most powerful of them, Mohammed Ibn al-Ahmar of Granada, became a tributary of Castile and ceded the strong town of Jaen (1246). In 1248 Seville, the second of the Mohammedan cities, submitted to Ferdinand, who within a few years annexed Xerez de la Frontera, Medina Sidonia, and Cadiz. By these acquisitions the frontier of Castile was extended to the southern coast before Ferdinand III.’s death in 1252. A considerable number of Moors submitted to the rule of Castile, but the Christians had become intolerant during the long war, and most of the conquered population sought a new home either in Granada or in Africa.

Meanwhile Aragon had taken a no less important part in the struggle. Pedro I. (1196–1213), the successor of Alfonso II., had excited the discontent of his subjects, partly by seeking coronation from Pope Innocent III., and partly by his excessive taxation. His son James I. (1213–1276), however, resumed the war against the infidels, and won in it the title of “The Conqueror.” With the help of his Catalonian subjects, at that time perhaps the most accomplished sailors in the world, he conquered the Balearic Islands (1229–1233), which had long been a stronghold of the Moslem and a center for piratical attacks upon the Christian states. Still more important was his reduction of Valencia (1238), which had once before been conquered by Ruy Diaz. The last achievement of the great king was the conquest of the province of Murcia (1266), the last of the Moorish territories in Spain except Granada.

From the latter half of the thirteenth century the crusading energy of the Spaniards came to a sudden standstill, and the Moors were allowed to retain possession of Granada for more than two centuries.

With the termination of the crusade Spanish history loses what little unity it had possessed for the last two centuries, and it becomes necessary to follow the fortunes of each state separately. Into the history of Granada it is as impossible as it would be tedious to enter within the limits of this article. It is a long record of revolution and civil war, in which nothing above the most petty personal interests are concerned. There is no change of dynasty, but one perpetual struggle between members of the same family. It would not be easy to enumerate even the names of the successive rulers, many of whom were several times deposed and restored to power. Even during the final struggle, when the existence of the kingdom was at stake and the one hope of resistence lay in unity, the national cause was sacrificed to the jealous rivalry of three claimants of the throne. The history of Castile and Aragon, on the other hand, assumes a new character and interest when the attention of kings and people ceased to be absorbed in the overwhelming excitement of a great religious war. From 1252 till 1474 these two kingdoms remained under separate rulers, being united at the latter date by the marriage of Ferdinand and Isabella.

Modern History.—The history of Spain as a united state dates from the union of Castile and Aragon by the marriage of Isabella and Ferdinand. The marriage took place in 1469, before the accession of either sovereign. In 1474 the crown of Castile was claimed by Isabella on the death of her brother Henry IV., whose daughter Joanna was universally believed to be illegitimate. It was contended by the partisans of Ferdinand that female succession was prohibited in Castile, and that he was entitled to the crown as the nearest male heir after his father. Ultimately the question was settled in Isabella's favor, and she obtained the most important rights of sovereignty, though the government was carried on in their joint names. It is possible that Ferdinand would have refused to accept this arrangement, if concerted action had not been necessary to oppose the party which espoused the cause of Joanna. A number of the Castilian nobles, headed by the marquis of Villena, dreaded the danger to the privileges of their order that might arise from the establishment of a strong government. They found an ally in Alfonso V. of Portugal, who was Joanna's uncle by the mother's side, and who cherished the design of obtaining the Castilian throne by a marriage with his niece. In 1476 the confederates were routed in the battle of Toro, and Alfonso departed to France with the chimerical plan of seeking assistance from Louis XI. The treaty of St. Jean de Luz between France and Castile in 1478 ruined these hopes, and in the next year Alfonso was compelled, by the treaty of Lisbon, to abandon the cause of his niece. This terminated the war of succession in Castile; and Joanna, known from her reputed father as La Beltraneja, retired into a convent. A few months before the treaty of Lisbon the death of John II. (January 20, 1479) gave to Ferdinand the succession to Aragon, Sicily, and Sardinia. Navarre, which had been brought to John II. by his first wife, passed to his daughter by that marriage, Eleanor, countess of Foix. Two provinces of the Aragonese crown, Roussillon and Cerdagne, had been pledged by John to Louis XI. of France, and were still retained by that monarch. The union of Castile and Aragon effected in 1479 was merely a personal union. Each province retained its own institutions and its own laws, and each would have resented the idea of absorption in the other.

The first care of the two sovereigns was to reform the system of government, especially in Castile, where the recent civil wars had given rise to serious disorders. One of their chief objects was to depress the nobles, whose privileges, acquired during the long struggle against the Moors, were inconsistent with a strong centralized government. The centralizing tendencies of the reign were carried still further in both provinces in the later period when Ximenes, who became archbishop of Toledo in 1495, exercised the chief influence. Five councils were intrusted with the administration of affairs—the "royal council," the chief court of justice; the "council of the supreme" for ecclesiastical business; the "council of the orders" for the great military fraternities; the "council of Aragon" for the management of that kingdom and of Naples; and the "council of the Indies" for the great discoveries of Columbus and his companions.

The political unity of Spain was to be based upon its religious unity. Both Ferdinand and Isabella were imbued with that stern spirit of orthodoxy with which the Spaniards were inspired by their long crusade against the infidel. No institution of their reign was so important as the Inquisition, which was authorized by a bull of Sixtus IV. in 1478, and constituted for the two kingdoms in 1483 under the presidency of Torquemada.

The steady extension of the royal power in Spain was due in no small degree, as Mâchiavelli has pointed out, to the constant succession of enterprises in which the attention of the nobles was absorbed. These enterprises may be summarized under three heads: (1) the union of the peninsula; (2) the extension of colonial empire; and (3) the acquisition of foreign territories.

(1) Under the first head the most important achievement was the final extinction of the Moorish power in Spain. The war which began in 1481 was carried on in a desultory manner for ten years, and was completed in 1492 by the conquest of Granada. In 1493 Ferdinand extorted from the fears and hopes of Charles VIII. of France the restoration of Roussillon and Cerdagne by the treaty of Barcelona. In 1512, after Isabella's death, he annexed Navarre. The whole peninsula was now united, with the exception of Portugal, and steps had been taken for the acquisition of that kingdom by marriage. Isabella, Ferdinand's eldest daughter, was married to Alfonso, the son and heir of John II. of Portugal. After the death of that prince, his widow married Emanuel, who succeeded to the Portuguese crown in 1495. Isabella herself died in giving birth to a son, but the connection was still maintained by the marriage of Emanuel to her younger sister Mary. The fruits of this persistent policy were not reaped, however, till the reign of Philip II.

(2) Maritime discovery was the task of the age, a task forced upon it by the Turkish occupation of the Levant, which had closed the old commercial routes to the East. The foremost pioneers in the work were the Portuguese and Spaniards, whose efforts brought them into rivalry with each other. The treaty of Lisbon in 1479 secured the western coast of Africa to Portugal, but enabled Spain to complete the annexation of the Canaries. The Spaniards now turned further westward, and a wholly new problem was created by Columbus' discovery of the West Indies in 1492. In 1498 Columbus landed on the continent of South America, and in a few years the whole western coast was explored by subsequent adventurers. In 1512 Ponce de Leon discovered Florida, and in the next year Balboa crossed the Isthmus of Darien and gazed for the first time upon the Pacific. No exertions were spared by the government to encourage settlement in its new territories.

(3) The foreign affairs of the reign, which were almost wholly connected with Italy, were conducted by Ferdinand on behalf of Aragon, just as the extension of the colonies was directed for the benefit of Castile.

In 1504 the unity of Spain was interrupted for a time by the death of Isabella. The successive deaths of the infant John (1497), of Isabella of Portugal (1498), and of her infant son Miguel (1500) had left the succession in Castile to the second daughter, Joanna; she was married to the archduke Philip, son of Maximilian I., and ruler, through his mother Mary of Burgundy, of the Netherlands and Franche-Comté. Philip, who had visited Spain in 1502, had then excited the distrust of his wife's parents, and Isabella by her will left the regency in Castile to her husband until the majority of their grandson Charles. But Ferdinand, in spite of his brilliant successes, was not popular among the Castilian nobles, who seized the opportunity to support the more natural claims of Philip to govern on behalf of his wife. Ferdinand showed his disgust by actions which threatened to undo all the previous objects of his policy. He concluded a treaty with Louis XII. in 1505, by which he undertook to marry the French king's niece, Germaine de Foix. To her Louis resigned his claims upon Naples, but in case of her death without issue his share in the kingdom by the treaty of Granada was to revert to France. Thus Ferdinand was willing to gratify his spite and to perpetuate the division between Aragon and Castile, under the penalty of forfeiting his recent conquests in Italy. His second marriage was concluded in March, 1506, and two months later he resigned the regency in Castile to Philip, and soon afterward sailed to Naples.

But the division of the peninsula was not destined to last long. On September 25th, Philip died at the age of twenty-eight, and the devotion of Ximenes secured the restoration of the regency to Ferdinand. Ferdinand threw himself with more energy than ever into the current of European politics. By joining the league of Cambray he wrested from Venice five important towns in Apulia which had been pawned to the republic by Ferdinand II. As a member of the Holy League against France he succeeded in conquering Navarre in 1512. Navarre had passed to the French family of Albret by the marriage of Catharine de Foix with Jean d'Albret, and it was the close connection with France which gave Ferdinand a pretext for its invasion. In 1515 his new conquest was formally incorporated with the kingdom of Castile. This was Ferdinand's last success; and he died on January 23, 1516.

With the death of Ferdinand begins the period of uninterrupted Hapsburg rule in Spain, which lasted for nearly two centuries. In the course of this period, the monarchy obtained absolute authority, and Spain, after rising for a time to be the foremost state in Europe, sank to the position of a second-rate power, from which it has never since emerged. Aragon and Castile were distinct kingdoms, and the former was again divided into the three provinces of Aragon, Catalonia, and Valencia, each of which had its own cortes, its own privileges, and the most warmly-cherished traditions of independence. The foreign possessions of the two crowns were a source of weakness rather than of strength. France stood ready at the earliest opportunity to contest the possession of Navarre with Castile, and that of Naples with Aragon.

The difficulties of domestic government were increased by the fact that the prospective ruler was a youthful foreigner, who had never visited Spain, and who was completely ignorant of the customs and even of the language of the country. Charles had been born and educated in the Netherlands, of which he had been nominal ruler ever since the death of his father in 1506. All his friends and advisers were Flemings, who cared nothing for Spanish interests, and had already acquired an evil reputation for selfish greed. The first symptom of discontent in Spain was excited by Charles' demand to be recognized as king, in utter disregard of his unfortunate mother. In Aragon the demand was unhesitatingly refused, but in Castile the vigorous measures of Ximenes secured Charles' proclamation. The regent, however, had great difficulties to face. The nobles, delighted to be rid of the strong government of Ferdinand, wished to utilize the opportunity to regain the privileges and independence they had lost. In this crisis the loyal devotion of Ximenes saved the monarchy. Throwing himself upon the support of the citizen class, he organized a militia which overawed the nobles and maintained order. A French invasion of Navarre was repulsed, and to avoid any danger from the discontent of the inhabitants, all the fortresses of the province, with the single exception of Pamplona, were dismantled. These distinguished services were rewarded with more than royal ingratitude by Charles, who came to Spain in 1517, and who allowed the aged cardinal to die on November 8th, without even granting him an interview.

Charles' reign belongs to the history of Europe rather than to that of Spain, and has been sufficiently treated elsewhere, (see CHARLES V.) His enormous inheritance was increased by the successes of Cortes in Mexico and of Pizarro in Peru, by his own annexation of the Milanese, and by his conquests in northern Africa. In the government of this vast empire Spain played an important but on the whole a subordinate part.

In 1555–56 he resigned all his dignities, and ended his life in 1558 in retirement at Yuste. From this time the house of Hapsburg is divided into the two branches of Spain and Austria. Charles' brother Ferdinand became king of the Romans and obtained the German territories of the family, to which he had added the crowns of Bohemia and Hungary. Philip II., Charles' only legitimate son, succeeded to the Spanish and Burgundian inheritance, with the addition of Milan. Philip II., like his father, played a great part in European history (see PHILIP II.), but with this important difference that Castile was definitely the central point of his monarchy, and that his policy was absolutely directed by Spanish interests. In character and education he was a Spaniard of the Spaniards, and after 1559 he never quitted Spain.

Philip's internal administration was everywhere successful in obtaining the objects which he set before himself. A rising of the Moors in the Alpujarras was crushed by the military ability of his famous half-brother, Don John of Austria. In 1580 a claim to the crown of Portugal, which Philip derived from his mother, was successfully asserted. Thus the unity of the peninsula was at last completed, while the colonial territories of Spain were immensely extended.

Outside Spain Philip's policy proved a complete failure. His religious intolerance excited the revolt of the Netherlands, which ended in the loss of the seven northern provinces. His grand schemes against England were utterly ruined by the destruction of the Spanish Armada. And, finally, his endeavor to establish a preponderant Spanish influence over France was foiled by the accession and triumph of Henry IV. The treaty of Vervins, by which he acknowledged his humiliating defeat, was almost the last act of Philip II.'s reign, which ended with his death on September 13, 1598.

Philip II. left to his son and successor, Philip III., an empire which was nominally undiminished, as the independence of the United Provinces had never been recognized, and the war for their reduction was still going on. But the unwieldy mass was suffering from internal exhaustion. The resources of Spain and the New World had been squandered in the prosecution of schemes of ambition which had ended in failure. The attention of the people had been distracted from peaceful industry to the unprofitable occupation of war. The soldiery of Spain, once reckoned invincible, had lost their prestige in the marshes of Holland. The enormous taxes, from which nobles and clergy were exempted, fell with ruinous severity upon the productive classes. Castile had suffered most, because it was most completely subject. The provinces which retained their liberties longest were more prosperous, even though they had no share in the riches that were poured into Castile from the western colonies. But they, too, had suffered from the king's reckless ambition, and from an economic policy which followed the most glaring errors of the Middle Ages. Every other consideration had been sacrificed to the accumulation of specie, with the result that prices were forced up to an abnormal height, while the wealth of the country bore no proportion to the currency. The nobles were carefully excluded from all political affairs, and ceased to take the slightest interest in the administration. When this exclusion came to an end after Philip II.'s death, they appear as mere courtiers, rivaling each other in the extravagance of their expenditure, but contributing nothing to the efficiency of the state. The government had been centralized by successive kings, but it was carried on without either wisdom or impartiality. The administration of justice was venal and incompetent. The people had been deprived of their liberties, but they failed to receive compensation in increased order and security. Spain had to pay dearly for its short period of glory. Its rapid decline in the seventeenth century was the inevitable penalty for the faults and errors of the sixteenth.

The piety of Philip III., which was as disastrous to Spain as the more masculine bigotry of his predecessors, found characteristic expression in the persecution of the Moriscoes. Ever since the suppression of their first revolt in 1502—a revolt which was provoked by the breach of the compact made on the fall of Granada—the conquered Moors had been cruelly oppressed. Charles V. renewed the edict of 1502 in 1526, and the overt profession of Mohammedanism was extinguished in Spain. But in secret they continued to cherish the faith of their ancestors, and this was enough to exasperate a monarch who preferred to have no subjects at all rather than to rule over heretics. An edict of Philip II. in 1566 forbade them to speak or write in Arabic, and ordered them to renounce all their traditional habits and ceremonies. Futile remonstrances were followed by a desperate rising, which was quelled in 1570. The most obstinate of the rebels were exiled to Africa, but most of them sullenly submitted. Philip III. determined to prove his zeal for orthodoxy by completing the work which his father had left unfinished. In 1609 all the Moriscoes were ordered to depart from the peninsula within three days, and the penalty of death was decreed against all who failed to obey, and against any Christians who should shelter the recalcitrant. The edict was obeyed, but it was the ruin of Spain. The Moriscoes were the backbone of the industrial population, not only in trade and manufactures, but also in agriculture. The haughty and indolent Spaniards had willingly left what they considered degrading employments to their inferiors. The Moors had introduced into Spain the cultivation of sugar, cotton, rice, and silk. Thay had established a system of irrigation which had given fertility to the soil. The province of Valencia in their hands had become a model of agriculture to the rest of Europe. In manufactures and commerce they had shown equal superiority to the Christian inhabitants, and many of the products of Spain were eagerly sought for by other countries. All these advantages were sacrificed to an insane desire for religious unity.

The resources of Spain, already exhausted, never recovered from this terrible blow. Philip II. died in March, 1621. His reign had not been glorious or advantageous to Spain, but it contrasts favorably with those of his successors. Spanish literature and art, which had received a great impulse from the intercourse with foreign countries under previous rulers, reached their zenith during his lifetime. Three writers have obtained European fame—Cervantes, who produced the immortal *Don Quixote* between 1605 and 1613, and two of the most fertile of romantic dramatists, Lope de Vega and Calderon. In the domain of art Spain produced two of the greatest masters of the seventeenth century, Velazquez and Murillo.

The time which Philip III. had spent on his devotions was given by his successor to the more secular pleasures of hunting and the theater. But Philip IV. shared to the full his father's disinclination to burden himself with the cares of government. The office of first minister was given to Zuñiga, the chief advocate of an aggressive policy in the late reign. All ideas of peace were abandoned, and Spain plunged headlong into the European struggle. The truce with the United Provinces was unpopular because the commercial progress of the Dutch was fatal to the trade of the Spanish Netherlands, and Amsterdam had already begun to take the place of Antwerp. The expiration of the truce in April, 1621, was followed by an immediate renewal of the war. To make the war successful it was imperative to secure the alliance with England, but this was sacrificed because the emperor insisted upon confiscating the Palatinate, which was conferred upon Maximilian of Bavaria. The match with the Spanish infanta was broken off, and Prince Charles married Henrietta Maria of France. The alienation of England was enough in itself to insure the ultimate failure of the Dutch War. On the mainland the successive stadtholders, Maurice and Frederick Henry, held their own even against the experienced Spinola, and after the latter's recall in 1629 had a distinct advantage. But it was by sea that the Dutch gained their most conspicuous successes.

In central Europe the fortune of war was more favorable to Spain and her allies. But the revival of the Hapsburg power awakened the jealousy of France, which in 1624 had fallen under the strong rule of Richelieu. Meanwhile the victories of Gustavus Adolphus had destroyed the imperial and Catholic ascendancy in Germany. The Spaniards were ignominiously driven from the positions which they occupied on the Rhine.

The death of Gustavus Adolphus at Lützen inspired the Roman Catholic powers with new hopes. Spain determined to strain every nerve to turn the tide of victory. At this crisis Richelieu decided to embark in the war as a principal, and concluded a close alliance with the Dutch against Spain. Not only were they repulsed from the Netherlands, but the Spanish actually invaded France (1636) and inspired a panic in the capital itself. This success, however, was only temporary, and before long the superior policy of Richelieu gave France the upper hand. Finally, more important than all, the alliance with Holland gave France the superiority by sea. The destruction of a great Spanish fleet in the Downs, where it had taken refuge under the neutral flag of England, made it almost impossible to send reënforcements from Spain to Brussels. By striking at the points of connection, Richelieu was breaking the unwieldy Spanish empire to pieces. At this moment his task was immensely facilitated by the outbreak of internal dissensions.

The revolt of Catalonia and Portugal, together with the undisguised discontent shown by several of the other provinces, could not but hamper Spain in the conduct of the European War. The French had now completely made up the military inferiority which had foiled their efforts at the beginning of the war. In 1643 Enghien (afterward the great Condé) won the first of a brilliant series of victories at Rocroi, and his success was the more important because it placed the domestic authority of the regent upon a firm footing. The disasters of Spain were increased by the formidable rising of Masaniello in Naples (1647), which was carried on by the duke of Guise and was suppressed with difficulty in 1648. This was followed by the loss of the Austrian alliance through the treaty of Westphalia. As it would have been impossible for Spain to contend single-handed against the hostile coalition, the opportunity was seized to make terms with Holland. This marks the final recognition of the United Provinces as an independent state, and also the transference to the northern powers of the maritime supremacy hitherto claimed by Spain.

France and Spain were now left face to face with each other. For the next four years the disturbances of the Fronde gave the Spaniards a great opportunity, of which they were not slow to avail themselves. The struggle was finally decided by the intervention of England. Mazarin gained over the Protector by promising to banish the Stuarts from France and to cede Dunkirk. Reënforced by 6,000 Ironsides, probably the best soldiers in Europe, Turenne was irresistible. It was impossible for Spain to continue the war. In 1659 Mazarin and Don Luis de Haro, the successor of Olivares, met on a small island in the Bidassoa, and there arranged the treaty of the Pyrenees. Spain had again to make great sacrifices.

Now that Spain was freed from external hostilities, it seemed possible that the reduction of Portugal might be at last accomplished. But the alliance of France was speedily replaced by that of England, and Catherine of Braganza was married to Charles II. Louis XIV., too, tried to obtain from the Spanish Government an acknowledgment of his wife's claims to the succession, and failing in this he continued to send secret assistance to the Portuguese. A French general, Schomberg, defeated Don John of Austria in 1663, and two years later routed the Spanish forces at the battle of Villa Viciosa. This final disaster crushed the declining energies of Philip IV., who died on September 17, 1665. As his son Charles II. was only four years old, he bequeathed the government to his widow Maria Anna of Austria, with a special junta to advise her in the conduct of affairs. In 1680 the king assumed the reins of government.

For a year Charles II. endeavored to rule in person with the help of the ordinary council, but the attempt only showed how the strength of the monarchy was bound up with the personal character of the ruler. "Charles V.," says Mignet, "had been both general and king; Philip II. was merely king, Philip III. and Philip IV. had not been kings; Charles II. was not even a man." From infancy Charles' health had been so defective that his death had appeared an imminent contingency, and his intellect was as feeble as his body. It was imposible for him to exercise any effective control over the government, and he was little more than a tool in the hands of the nobles.

The decline of Spain in the seventeenth century is not to be measured by its territorial losses. Holland had extorted a tardy recognition of its independence; Portugal was once more a separate kingdom; Catalonia was reduced only to very doubtful submission; France had seized upon Roussillon and Cerdagne, Franche-Comté, and great part of the southern Netherlands; French influence had been established in Italy as a counterpoise to that of Spain. But the weakness of the extremities, to which these facts bear conclusive testimony, was the result of still greater weakness at the center. The population of the peninsula, estimated at 20,000,000 under the Arabs and at 12,000,000 under Ferdinand and Isabella, had fallen to less than 6,000,000 in the reign of Charles II. This decrease of numbers was doubtless due in the first place to the religious bigotry which had condemned thousands of Jews and Moriscoes to death or exile, but it is partly traceable to a fatal decline in the economic prosperity of the country.

In spite of its loss of power and prestige, the crown of Spain was still regarded as a prize well worth winning. Ever since Charles II.'s accession the Spanish succession had been a prominent question for European diplomacy, and from 1697 it became the pivot on which international relations turned. Charles II.'s first wife, Maria Louisa of Orleans, had died childless in 1689, aud his second marriage to Maria Anna of Neuburg was equally unfruitful. The male line of the Spanish Hapsburgs was evidently on the verge of extinction, and by law and tradition the crown would pass to the nearest female or her heir. But the question was complicated in many ways. Of Charles II.'s two sisters, the elder, Maria Theresa, had married Louis XIV., and had renounced her claims, but her husband had always protested against the renunciation, and the non-payment of the stipulated dowry gave him an argument for its nullity. The younger, Margaret Theresa, had married the emperor Leopold I., and had made no renunciation; but she had since died, leaving an only daughter, Maria, who married the elector of Bavaria. Going a generation back, the two sisters of Philip IV. had also married into the houses of Bourbon and Hapsburg. Anne of Austria, whose renunciation of the Spanish crown was undisputed, was the mother of Louis XIV., while Maria Anna was the mother of Leopold I. Ever since the division of the house of Hapsburg into two branches it had been agreed by a family compact that if either became extinct the other should succeed to its territories. Leopold I. was extremely anxious to restore the unity of the family by securing the observance of this compact, and he had a great advantage in the fact that Charles II.'s mother was his own sister, and Charles' second wife was his sister-in-law. The will of Philip IV. had arranged that, after Charles II. and his descendants, the crown should pass, first to Margaret Theresa and her children, and secondly to Leopold and his children. It was a great disappointment to Leopold that his first wife left him only a daughter, but he tried to secure the claims of his family by extorting from her on her marriage a renunciation of her rights to the crown of Spain. This renunciation the Spanish Government had never recognized, and the queen-mother, whose adherence to the Hapsburg interests was overcome by her feelings for her own family, induced Charles II. to make a will in 1696 in which he named Joseph Ferdinand, the infant electoral prince of Bavaria, as his heir. But the queen-mother's death withdrew the dominant influence of the court of Madrid and enabled the Austrian envoy, Count Harrach, with the help of the queen, to procure the revocation of this will. The succession now became the subject of party quarrels and intrigues, in which the rival envoys of Austria and France took a prominent part.

Too many European interests were involved in the succession to allow it to be settled as a mere question of domestic politics. The idea of the balance of power dominated European diplomacy at this time, and William III. of England was its avowed and recognized champion. England and Holland, the two countries with which William was connected, were vitally interested in the Spanish trade. The accession of a French prince in Spain would almost inevitably transfer to France all the advantages which they at present enjoyed. It was obvious that William III. must have a voice in the settlement of this succession, and Louis XIV., who had no desire for a new European war, was willing to recognize this. The negotiations between England and France resulted in the first treaty of partition (October 11, 1698). The electoral prince was to receive the bulk of the Spanish empire, viz., Spain itself, the Netherlands, Sardinia, and the colonies; the dauphin was to have Naples, Sicily, Finale, and Guipuzcoa; while Lombardy was to go to the archduke Charles. This treaty had one fatal defect—that it was based solely on the interests of the contracting powers and took no account of the wishes of the Spaniards, who resented any proposal for the division of the empire. The first hint of the treaty irritated Charles II. into making a second will in November in favor of the electoral prince, and all parties in Spain agreed in its approval. But within three months both treaty and will were rendered null by the sudden death of the infant prince (February, 1699), and the question, thus reopened, became more thorny than ever, as the choice now lay definitely between Austria and France. It seemed almost impossible to prevent the outbreak of a general war, but William III. patiently reunited the broken threads of his diplomacy, and arranged with France a second treaty of partition. The Spanish monarchy was to be divided into two parts. The larger, consisting of Spain, the Netherlands, Sardinia, and the colonies, was to go to the archduke Charles. The dauphin was to receive the share stipulated in the former treaty, with the material addition of Lorraine. The duke of Lorraine was to be compensated with the Milanese. This treaty, unlike the first, was communicated to Austria; but the emperor, who was now confident of securing the whole inheritance, refused to accept it.

Charles II., feeble to the last, succumbed to this combination of influences, and signed a testament bequeathing the succession to Philip of Anjou, the second grandson of Louis XIV., on condition that he would renounce all claims to the crown of France (October 3, 1700). Thus his last act was to disinherit his own family in favor of the enemy with whom he had been at war almost all his reign. He died on November 1, 1700.

Everything now depended upon the decision of Louis XIV. The treaty of partition offered substantial advantages to France; Charles II.'s will would exalt the house of Bourbon above every other family in Europe. His hesitation, whether real or feigned, did not last long. On November 16 he introduced his grandson to the French court as Philip V. of Spain. Philip V. was proclaimed in all parts of the Spanish monarchy amid popular acclamations. Leopold I. protested and prepared to attack Lombardy, but he could not hope to obtain the whole succession for his son without the assistance of the maritime powers. William III., who saw the aims of his life threatened with ruin, was eager for war, but his subjects, both in England and Holland, were resolute to maintain peace. In these circumstances Louis XIV. played into the hands of his enemies. He expelled the Dutch garrisons from the fortresses of the Netherlands which they had occupied since the treaty of Ryswick, and replaced them by French troops. He showed a cynical intention to regard Spain as a province of France, and he took measures to secure for the French the commercial advantages hitherto enjoyed by England and Holland. William III. was thus enabled to conclude the Grand Alliance (September 7, 1701), by which the contracting powers undertook to obtain the Netherlands and the Italian provinces of Spain for the archduke Charles and to preserve the mercantile monopoly of the English and Dutch. A few days afterwards James II. died at St. Germains, and Louis XIV. was injudicious enough to acknowledge his son as king of England. This insult exasperated public opinion in that country; the Tory parliament was dissolved; and the last obstacle to William's warlike policy was swept away. William himself died in March, 1702, but he left the continuance of his policy to the able hands of Marlborough and Heinsius. The war which the emperor had commenced single-handed in 1701 became general in the next year.

It is needless to follow the military operations of the War of the Spanish Succession, which have been rendered famous by the exploits of Eugene and Marlborough. The chief scenes of hostilities were the Netherlands, Germany and Italy, in each of which the French suffered fatal and humiliating reverses. The war was ended in 1711 by the treaty of Utrecht.

Philip V. was acknowledged as king of Spain, on condition that he should formally renounce all eventual claims to the crown of France. But the partition of the Spanish monarchy was insisted upon by the allies. The Netherlands were to be handed over to Austria, on condition that the Dutch should garrison the barrier fortresses. Austria was also to receive the Italian provinces of Spain, with the exception of Sicily, which was given to the duke of Savoy with the title of king. England naturally obtained considerable advantages from a war in which she had borne so prominent a part. The acquisition of Gibraltar and Minorca gave her the control of the Mediterranean. The *asiento* conferred upon her the privilege of importing slaves into the Spanish colonies, and she also obtained the right of sending a single vessel into the South Seas. France had to recognize the Protestant succession, and to cede Newfoundland, Acadia (Nova Scotia), and Hudson's Bay. Charles VI. refused to accept the terms offered to him at Utrecht, but he found it impossible to carry on the war by himself, and in 1714 he made peace with France by the treaty of Rastatt.

With the final accession of a Bourbon king Spain entered upon a new period of history, in which it once more played a considerable part in European politics. Under the influence of Elizabeth Farnese, the second queen of Philip, Spain was once more plunged into wars which lasted thirty years—the first being the war of the Polish succession, then of the Austrian succession—the country in the meantime being embroiled with England.

Philip V. died on July 9, and was succeeded by Ferdinand VI., the only surviving son of his first marriage. Elizabeth Farnese, "the termagant," as Carlyle calls her, whose ambition had kept Europe embroiled for thirty years, went into retirement at San Ildefonso. This event naturally influenced the war in Italy. It was not likely that the new king, who had never been on good terms with his stepmother, would expend more of his country's blood and treasure to obtain a principality for his half-brother.

Ferdinand VI. was as feeble in health and as averse to business as his father had been, but he was equally obstinate on certain points. He would have nothing to do with the aggressive policy of his stepmother or with the Bourbon schemes for the humiliation of England. His accession broke off the Family Compact, and gave to Spain the unaccustomed boon of thirteen years' peace. His aim was to hold the balance between the rival powers of western Europe, and in this he was aided by the discord between his two ministers, Ensenada and Carvalho, of whom the former favored France and the latter England. When Kaunitz, the Austrian envoy at Versailles, was endeavoring to negotiate an alliance between the Hapsburgs and Bourbons, Ferdinand seized the opportunity to conclude the treaty of Aranjuez, which guaranteed the neutrality of the Italian provinces of the two families. On the outbreak of the Seven Years' War in 1756 great efforts were made to draw Spain into the struggle. France offered Minorca, which had been lost by Byng at the first outbreak of hostilities, and England hastened to make the counter-proposition of a cession of Gibraltar. Ferdinand, however, refused both bribes, and maintained his policy of peace till his death, in 1759.

This event gave the Spanish crown to Charles III., who had ruled the Two Sicilies since 1735. His accession threatened a speedy reversal of Spanish policy. The new king was a true Bourbon, and naturally inclined to the French alliance. He had an old grudge against England for the treatment he had received in the War of the Austrian Succession. In 1761 the third Family Compact was concluded, and Spain undertook to give active assistance to France unless peace were concluded within a year. Pitt, suspecting the existence of this agreement, proposed an immediate declaration of war against Spain, but he failed to convince his cabinet and resigned. His successors, however, were driven to adopt his policy, and in January, 1762, hostilities commenced between the two countries. By the treaty of Paris (February, 1763) England recovered Minorca, extended its colonies in every direction at the expense of France, and rejected all the demands which Charles III. had advanced on behalf of Spain. Spain soon after entered the Coalition against England, but with no beneficial result to her own interests.

The death of Charles III. and the accession of Charles IV. were contemporary with the outbreak of the French Revolution, which was destined to exercise a decisive influence over the fortunes of the adjacent peninsula. Florida Blanca, who continued to hold office during the first three years of the new reign, found it impossible to continue his policy. The revival of Spain could only be effected by the restoration of its naval and colonial ascendancy at the expense of England, and for the carrying out of this scheme the support of France was imperatively necessary. But the French alliance rested upon the relationship between the two branches of the house of Bourbon, and the Family Compact ceased to exist when Louis XVI. was deprived of power by his subjects.

The execution of Louis XVI. (January 21, 1793) made a profound impression in a country where loyalty was a superstition. Charles IV. was roused to demand vengeance for the insult to his family, and from one end of Spain to the other a cry resounded for immediate war with the impious rebels who had shed the blood of an anointed king. Godoy, the prime minister, had nothing to do but to follow the national impulse, and Spain became a member of the first coalition against France. Everything seemed to promise a rapid and complete success. The number of volunteers who offered their services rendered conscription unnecessary; and the southern provinces of France were so preponderatingly royalist that they were ready to welcome the Spaniards as deliverers. These advantages, however, were nullified by the shameful incompetence and carelessness of the government. The troops were left without supplies; no plan of combined action was imposed upon the commanders; and each regiment was left to act of its own will. The military action of Spain provoked the contempt of Europe. The two campaigns of 1793 and 1794 were one long catalogue of failures. Instead of reducing the southern provinces of France, the Spaniards were driven from the strong fortresses that guarded the Pyrenees, and the French advanced almost to the Ebro And at the same time the English, the hated rivals of Spain, were utilizing the war to extend their colonial power and were establishing more firmly that maritime supremacy which the Spanish government had been struggling for almost a century to overthrow. Under the circumstances it is no wonder that the Queen and Godoy hastened to follow the example set by Prussia, and concluded the treaty of Basel with France.

For nearly three years Spain was allowed to remain at peace. Its finances were partially revived by the restoration of free intercourse with the colonies and by the payment of the supplies which had been withheld for the last six years. But the administration was as incompetent and misdirected as ever. Godoy, since his return to office, had abandoned all connection with the reforming party and had thrown himself into the reactionary policy of Caballero. The Spanish church was once more placed in strict subjection to the Roman see, from which for a short time it had been freed. But the worst evil lay in the undisguised domination of France, which the government was wholly incapable of shaking off. As soon as Bonaparte saw himself involved in a new war with England, he turned to Spain for assistance and extorted a new treaty (October 9, 1803), which was still more burdensome than that of 1796.

In October, 1807, Spain accepted the treaty of Fontainebleau, which arranged a partition of Portugal into three parts. The northern provinces were to be given to the young king of Etruria, who was to purchase them by the cession of Tuscany. In the south a principality was to be carved out for Godoy himself. The central district was to be kept in pledge by France until the conclusion of a general peace. The treaty was hardly concluded when a French army under Junot marched through Spain to Portugal, and the royal family of that country fled to Brazil. But Spain was destined to share the same fate as its neighbor. The crown prince, whose wife had died in 1806, determined to imitate his rival by bidding for French support. He entered into secret relations with Beauharnais, Napoleon's envoy at Madrid, and went so far as to demand the hand of a Bonaparte princess. Godoy, who discovered the intrigue, induced Charles IV. to order his son's arrest. Napoleon at once seized the opportunity to make himself absolute master of Spain, and ordered French troops to cross the Pyrenees in support of the prince. This act terrified Godoy into a reconciliation with his opponents, but the French invasion was not delayed by the removal of its pretext. Charles IV. and his minister, conscious that they could expect no support from the people, determined on flight. The news of this intention, however, excited a popular rising in Madrid, and the king was compelled to abdicate in favor of his son. Murat, however, who commanded the French, refused to be turned aside by this change of circumstances. He obtained from Charles IV. a declaration that his abdication had been involuntary, and occupied Madrid (March 23, 1808). Meanwhile Napoleon advanced to the frontier, and Ferdinand was lured by French agents to an interview with the emperor at Bayonne. There he was confronted with his parents and Godoy, and was intimidated into restoring the crown to his father, who at once made a second abdication. Napoleon now divulged the real intention of his actions, and the crown of Spain was formally conferred upon his brother Joseph Bonaparte, who two years before had been made king of Naples.

In the constitution which was promulgated early in 1812 the principles of the French constituent assembly were closely followed. The Inquisition had already perished, and the last relics of the old autocratic government shared its fate. Supreme legislative power was placed in the hands of a single national assembly, and effective checks were devised to restrict the power of the monarchy whenever it should be revived. The freedom of the press was established, and the property of the clergy was confiscated to defray the expenses of the war. The great defect of the constitution was that it was the work of one party, to which circumstances had given a temporary supremacy, and it failed to command the support of the united nation. The nobles and priests were bitterly hostile, and the latter had more influence in Spain than in any European country except Ireland.

The restoration of Spanish independence could hardly have been accomplished without the assistance of England. Wellington had already made two attempts to advance from Portugal into the adjacent kingdom, but had been foiled by superior forces. In 1812 he determined on a great effort. He secured his base of operations by the capture of Ciudad Rodrigo and Badajoz, and at Salamanca he completely routed the opposing army of Marmont. This victory enabled the English general to enter Madrid (August 12th), and Joseph retreated to Valencia. Napoleon, who had suffered a crushing defeat at Leipsic, hastened to recognize the impossibility of retaining Spain by releasing Ferdinand VII., who returned to Madrid in March, 1814.

After the convulsions it had endured Spain required a period of firm but conciliatory government, but the ill-fate of the country gave the throne at this crisis to the worst of her Bourbon kings. Ferdinand VII. had never possessed the good qualities which popular credulity had assigned to him, and he had learnt nothing in his four years' captivity except an aptitude for lying and intrigue. He had no conception of the duties of a ruler; his public conduct was regulated by pride and superstition, and his private life was stained by the grossest sensual indulgence.

But Spain was not allowed to work out its own salvation. Europe was dominated at this time by the Holy Alliance, which disguised a resolution to repress popular liberties and to maintain despotism under a pretended zeal for piety, justice, and brotherly love. At the congress of Verona (October, 1822) France, Austria, Russia and Prussia agreed upon armed intervention in Spain, in spite of the protest of Canning on the part of England. Spain was to be called upon to alter her constitution and to grant greater liberty to the king, and if an unsatisfactory answer were received France was authorized to take active measures. The demand was unhesitatingly refused, and a French army, 100,000 strong, at once entered Spain under the duke of Angoulême (April, 1823). No effective resistance was made, and Madrid was entered by the invaders (May 23d). The cortes, however, had carried off the king to Seville, whence they again retreated to Cadiz. The bombardment of that city terminated the revolution and Ferdinand was released (October 1). His first act was to revoke everything that had been done since 1819. The Inquisition was not restored, but the secular tribunals took a terrible revenge upon the leaders of the rebellion. The protest of the duke of Angoulême against these cruelties was unheeded. Even the fear of revolt, the last check upon despotism, was removed by the presence of the French army, which remained in Spain till 1827. But Spain had to pay for the restoration of the royal absolutism, as Canning backed up his protest against the intervention of France by acknowledging the independence of the Spanish colonies.

Ferdinand VII. was enabled to finish his worthless and disastrous reign in comparative peace. In 1829 he married a fourth wife, Maria Christina of Naples, and at the same time he issued a "Pragmatic Sanction" abolishing the Salic law in Spain. No one expected any practical results from this edict, but a formal protest was made against it by the king's brothers, Carlos and Francisco, and also by the French and Neapolitan Bourbons. In the next year, however, the queen gave birth to a daughter, Isabella, who was proclaimed as queen on her father's death in 1833, while her mother undertook the office of regent. Don Carlos at once asserted his intention of maintaining the Salic law, and rallied round him all the supporters of absolutism, especially the inhabitants of the Basque Provinces. Christina was compelled to rely upon the liberals, and to conciliate them by the grant of a constitution, the *estatuto real*, which established two chambers chosen by indirect election. But this constitution, drawn up under the influence of Louis Philippe of France, failed to satisfy the advanced liberals, and the Christinos split into two parties, the *moderados* and *progresistas*. In 1836 the latter party extorted from the regent the revival of the constitution of 1812. All this time the government was involved in a desperate struggle with the Carlists, who at first gained considerable successes under Zumalacarregui and Cabrera. But the death of Zumalacarregui in 1835 and the support of France and England ultimately gave the regent the upper hand, and in 1839 her general, Espartero, forced the Basque Provinces to submit to Isabella. Don Carlos renounced his claims in favor of his eldest son, another Carlos, and retired to Trieste, where he died in 1855. Christina now tried to sever herself from the *progresistas*, and to govern with the help of the moderate party who enjoyed the patronage of Louis Philippe. But England, jealous of French influence at Madrid, threw the weight of her influence onto the side of the radicals, who found a powerful leader in Espartero. In 1840 Christina had to retire to France, and Espartero was recognized as regent by the cortes. But his elevation was resented by the other officers, while his subservience to England made him unpopular, and in 1843 he also had to go into exile. Isabella was now declared of age. Christina returned to Madrid, and the *moderados* under Narvaez obtained complete control over the government. This was a great victory for France, and Louis Philippe abused his success by negotiating the infamous "Spanish marriages." A husband was found for Isabella in her cousin, Francis of Assis, whose recommendation in French eyes was the improbability of his begetting children. On the same day the queen's sister, Maria Louisa, was married to Louis Philippe's son, the duke of Montpensier. By this means it was hoped to secure the reversion of the Spanish throne for the house of Orleans. The scheme recoiled on the heads of those who framed it. The alienation of England gave a fatal impulse to the fall of Louis Philippe, while the subsequent birth of children to Isabella deprived the Montpensier marriage of all importance.

Spanish history during the reign of Isabella II. presents a dismal picture of faction and intrigue. The queen herself sought compensation for her unhappy marriage in sensual indulgence, and tried to cover the dissoluteness of her private life by a superstitious devotion to religion and by throwing her influence onto the side of the clerical and reactional party. Every now and then the *progresistas* and *moderados* forced themselves into office, but their mutual jealousy prevented them from acquiring any permanent hold upon the government. In 1866 Isabella was induced to take vigorous measures against the liberal opposition. Narvaez was appointed chief minister; and the most prominent liberals, Serrano, Prim, and O'Donnell, had to seek safety in exile. The cortes were dissolved, and many of the deputies were transported to the Canary Islands. The ascendancy of the court party was maintained by a rigorous persecution, which was continued after Narvaez's death (April, 1868) by Gonzales Bravo. Common dangers succeeded at last in combining the various sections of the liberals for mutual defense, and the people, disgusted by the scandals of the court and the contemptible *camarilla* which surrounded the queen, rallied to their side. In September, 1868, Serrano and Prim returned to Spain, where they raised the standard of revolt and offered the people the bribe of universal suffrage. The revolution was speedily accomplished, and Isabella fled to France, but the successful rebels were at once confronted with the difficulty of finding a successor for her. During the interregnum Serrano undertook the regency, and the cortes drew up a new constitution, by which an hereditary king was to rule in conjunction with a senate and a popular chamber. As no one of the Bourbon candidates for the throne was acceptable, it became necessary to look round for some foreign prince. The offer of the crown to Leopold of Hohenzollern-Sigmaringen excited the jealousy of France, and gave Napoleon III. the opportunity of picking a quarrel, which proved fatal to himself, with the rising state of Prussia. At last a king was found (1870) in Amadeus of Aosta, the second son of Victor Emmanuel, who made an honest effort to discharge the difficult office of a constitutional king in a country which was hardly fitted for constitutional government. But he found the task too hard and too distasteful, and resigned in 1873. A provisional republic was now formed, of which Castelar was the guiding spirit. But the Spaniards, trained to regard monarchy with superstitious reverence, had no sympathy with republican institutions. Don Carlos seized the opportunity to revive the claim of inalienable male succession, and raised the standard of revolt in the Basque Provinces, where his name was still a power. The disorders of the democrats and the approach of civil war threw the responsibility of government upon the army. The cortes were dissolved by a military *coup d'état;* Castelar threw up his office in disgust; and the administration was undertaken by a committee of officers. Anarchy was suppressed with a strong hand, but it was obvious that order could only be restored by reviving the monarchy. Foreign princes were no longer thought of, and the crown was offered to and accepted by Alfonso XII., the young son of the exiled Isabella (1874). His first task was to terminate the Carlist War, which still continued in the north, and this was successfully accomplished in 1876. Time was required to restore the prosperity of Spain under a peaceful and orderly government and to consolidate by prescription the authority of the restored dynasty. Unfortunately a premature death carried off Alfonso XII. in 1885, before he could complete the work which circumstances laid upon him. The regency was intrusted to his widow, Christina of Austria, and the birth of a posthumous son (May 17, 1886), who is now the titular king of Spain, has excited a feeling of pitying loyalty which may help to secure the Bourbon dynasty in the last kingdom which is left to it.

LANGUAGE.—The Iberian Peninsula is not a linguistic unity. Not to speak of the Basque, which still forms an island of some importance in the northwest, three Romance languages share this extensive territory:—(1) Portuguese-Galician, spoken in Portugal, Galicia, and a small portion of the province of Leon; (2) Castilian, covering about two-thirds of the peninsula in the north, center, and south; (3) Catalan, occupying a long strip of territory to the east and southeast.

Catalan.—This domain now embraces, on the mainland, the Spanish provinces of Gerona, Barcelona, Tarragona, and Lerida (the old principality of Catalonia), and of Castellon de la Plana, Valencia, and Alicante (the old kingdom of Valencia), and, in the Mediterranean, that of the Balearic Islands (the old kingdom of Majorca). Catalan, by its most characteristic features, belongs to the Romance of southern France and not to that of Spain; it is legitimate, therefore, to regard it as imported into Spain by those *Hispani* whom the Arab conquest had driven back beyond the mountains into Languedoc, and who in the ninth century regained the country of their origin; this conclusion is confirmed by the fact that the dialect is also that of two French provinces on the north of the Pyrenees—Roussillon and Cerdagne. From the ninth to the twelfth century Catalan spread farther and farther within the limits of Catalonia, properly so called; in 1229 it was brought to Majorca by Jaime el Conquistador, and in 1238 the same sovereign carried it to Valencia also. Even Murcia was peopled by Catalans in 1266, but this province really is part of the Castilian conquest, and accordingly the Castilian element took the upper hand and absorbed the dialect of the earlier colonists. The river Segura, which falls into the Mediterranean in the neighborhood of Orihuela, a little to the north of Murcia is as nearly as possible the southern boundary of the Catalan domain; westward the boundary coincides pretty exactly with the political frontier, the provinces of New Castile and Aragon not being at all encroached on. Catalan, which by the reunion of Aragon and the countship of Barcelona in 1137 became the official language of the Aragonese monarchy—although the kingdom of Aragon, consisting of the present provinces of Saragossa, Huesca, and Teruel, has always been Castilian in speech—established a footing in Italy also, in all parts where the domination of the kings of Aragon extended, viz., in Sicily, Naples, Corsica, and Sardinia, but it has not maintained itself there in modern times except in a single district of the last-named island (Alghero); everywhere else in Italy, where it was not spoken except by the conquerors, nor written except in the royal chancery, it has disappeared without leaving a trace.

From the thirteenth century the name given to the vulgar tongue of eastern Spain has been *Catalanesch* (*Catalaniscus*) or *Catalá* (*Catalanus*)—the idiom of the Catalans. By Catalanesch or Catalá was understood, essentially, the spoken language and the language of prose, while that of poetry, with a large admixture of Provençal forms was early called *Lemosi*, *Limosi* or language of Limousin—Catalan grammarians, and particularly the most celebrated of them, Ramon Vidal de Besalú, having adopted *Lemosi* as the generic name of the language of the troubadours. These grammarians carefully distinguish the vulgar speech, or *pla Catalá*, from the refined *trobar* idiom, which originally is simply a more or less modified form of Provençal. Afterward, and especially in these parts of the Catalan domain outside of Catalonia which did not care to acknowledge that they derived their language from that province, *Lemosi* received a more extensive signification, so as to mean the literary language in general, whether of verse or of prose. To this hour, particularly in Valencia and the Balearics, *Lemosi* is employed to designate on the one hand the old Catalan and on the other the very artificial and somewhat archaizing idiom which is current in the "jochs florals;" while the spoken dialect is called, according to the localities, *Valenciá* (in Valencia), *Majorquí* and *Menorquí* (in Majorca and Minorca), or *Catalá* (in Catalonia); the form *Catalanesch* is obsolete.

Castilian.—This name (derived from the kingdom of Castile, the most powerful element in the Spanish monarchy) is the most convenient designation to apply to the linguistic domain which comprises the whole of central Spain and the vast regions of America and Asia colonized from the sixteenth century onward by the Spaniards. We might also indeed call it the *Spanish* domain, narrowing the essentially geographical meaning of the word *Español* (derived, like the other old form *Españon*, from *Hispania*), and using it in a purely political sense. But the first expression is to be preferred, all the more because it has been long in use, and even the inhabitants of the domain outside the two Castiles fully accept it and are indeed the first to call their idiom *Castellano.* It is agreed on all hands that Castilian is one of the two branches of the vulgar Latin of Spain, Portuguese-Galician being the other; both idioms, now separated by very marked differences, can be traced back directly to one common source—the Hispanic Romance. One and the same vulgar tongue, diversely modified in the lapse of time, has produced Castilian and Portuguese as two varieties, while Catalan, the third language of the Peninsula, connects itself, as has already been pointed out, with the Gallo-Roman.

Within the Castilian domain, thus embracing all in Spain that is neither Portuguese nor Catalan, there exist linguistic varieties which it would perhaps be an exaggeration to call dialects, considering the meaning ordinarily attached to that word, but which are none the less worthy of attention. Generally speaking, from various circumstances, and especially that of the reconquest, by which the already-formed idiom of the Christian conquerors and colonists was gradually conveyed from north to south, Castilian has maintained a uniformity of which the Romance languages afford no other example. We shall proceed in the first instance to examine the most salient features of the *normal Castilian*, spoken in the provinces more or less closely corresponding to the old limits of Old and New Castile. This is the language usually considered as classical Spanish, occupying the same position in regard to that language as Tuscan does to Italian.

In some respects Castilian is hardly further removed from classical Latin than is Italian; in others it has approximately reached the same stage as Provençal. As regards the tonic accent and the treatment of the vowels which come after it, Castilian may be said to be essentially a paroxytonic language, though it does not altogether refuse proparoxytonic accentuation, and it would not be a mistake to regard vocables like *lámpara*, *lágrima*, *rápido*, etc., as learned words. In this feature, and in its almost universal conservation of the final vowels *e*, *i*, *u* (*o*), Castilian comes very near Italian, while it separates from it and approaches the Gallo-Roman by its modification of the consonants.

Portuguese.— Portuguese-Galician constitutes the second branch of the Latin of Spain. In it we must distinguish—(1) Portuguese (*Portuguez*, perhaps a contraction from the old *Portugalez* = Portúgalensis), the language of the kingdom of Portugal and its colonies in Africa, Asia and America (Brazil); (2) Galician (*Gallego*), or the language of the old kingdom of Galicia (the modern provinces of Pontevedra, La Coruña, Orense, and Lugo) and of a portion of the old kingdom of Leon (the territory of Vierzo in the province of Leon). Portuguese, like Castilian, is a literary language, which for ages has served as the vehicle of the literature of the Portuguese nation constituted in the beginning of the twelfth century. Galician, on the other hand, which began early in the Middle Ages a literary life—for it was employed by Alfonso the Wise in his *cantigas* in honor of the Virgin—decayed in proportion as the monarchy of Castile and Leon, to which Galicia had been annexed, gathered force and unity in its southward conquest. At the present day Gallego, which is simply Portuguese variously modified and with a development in some respects arrested, is far from having as a dialect the same importance as Catalan, not only because the Spaniards who speak it (1,800,000) number much less than the Catalans (3,500,000), but also because, its literary culture having been early abandoned in favor of Castilian, it inevitably fell into the vegetative condition of a provincial patois. Speaking generally, Portuguese is further removed than Castilian from Latin; its development has gone further, and its actual forms are more worn out than those of the sister language, and hence it has, not without reason, been compared to French, with which it has some very notable analogies. But, on the other hand, Portuguese has remained more exclusively Latin in its vocabulary, and, particularly in its conjugation, it has managed to preserve several features which give it, as compared with Castilian, a highly archaic air. Old Portuguese, and more especially the poetic language of the thirteenth century, received from the language of the troubadors, in whose poetry the earlier Portuguese poets found much of their inspiration, certain words and certain turns of expression which have left upon it indelible traces.

LITERATURE.—The name Spanish is now generally restricted to the literature of the Castilian tongue. In the present article it is taken in the wider sense as embracing the literature of the whole Iberian Peninsula, with the exceptions of PORTUGAL (*q.v.*) and of Galicia, the latter of which as regards language and literature belongs to the Portuguese domain. Spanish literature thus considered falls into two divisions—Castilian and Catalan. Of the Castilian texts now extant none are of earlier date than the twelfth century, and very probably none go farther back than 1150. That accepted as the oldest—the *Mystery of the Magian Kings*—is a fragment of a short semi-liturgical play meant to be acted in the church of Toledo at the feast of Epiphany. Manifestly an imitation of the Latin *ludi* represented in France in the twelfth century, the Spanish piece cannot have been composed much before 1150. The great national hero Rodrigo Diaz de Bivar (died 1099), better known in history by the Arabic surname of the CID (*q.v.*), was celebrated in the vulgar tongue less than a century after his death in two poems, neither of which, however, has come down to us in its entirety. The first *cantar*, usually entitled *Poema del Cid* since the first edition by Tomas Antonio Sanchez, relates in its first part the valiant deeds (*la gesta*) of the Cid subsequent to his quarrel with King Alfonso VI.; in the second the capture of Valencia, the reconciliation of the hero with the king, and the marriage of his daughters with the "infantes" of Carrion; and then in the third the treason of the infantes, the vengeance of the Cid, and the second marriage of his daughters with the infantes of Navarre and Aragon. The narrative of the last years of the Cid, which closes this third part, is very much curtailed.

The other heroes of Spanish history, such as the last Gothic king Roderick, Bernardo del Carpio, the infantes of Lara, have not given rise to long poems; at least we are acquainted with none of which they are the subject. With the heroic poetry which takes its themes from the national history and legends, there grew up in the thirteenth century a religious and didactic poetry, the most eminent representative of which is Gonzalo de Berceo (1198–1268). They are written in single-rhyme quatrains and in verses of twelve to fourteen syllables, according as the ending of each hemistich is masculine or feminine. The single-rhyme quatrain, introduced in imitation of the French poetry of the twelfth century into Castilian literature, became from the time of Berceo and the *Alexandro* and *Appolonio* the regular form in Castilian narrative and didactic poetry, and prevailed down to the close of the fourteenth century. The fourteenth century saw the birth of the most original mediæval Spanish poet. Juan Ruiz, archpriest of Hita (near Guadalajara), born in 1300 and died fifty years later. Ruiz celebrates love and woman; his book is of *buen amor*, that is, he shows by his own experience and the example of the authors whom he follows how a man ought to set to work to be a successful lover. The character of the female go-between, named "Trota-Conventos," here plays an important part; it was suggested to Ruiz by the *Pamphilus*, but he has greatly strengthened the characteristics and thus prepared the way for the Celestina of the close of the fifteenth century. By way of precaution, the author represents himself as one who has survived his illusions, and maintains that carnal love (*loco amor*) must in the long run give place to divine love; but this stratum of devotion is a thin one and ought not to disguise the real character of the work. His form of versification is the single-rhyme quatrain in the narrative portions; as to the "songs" (*cantigas*) which sometimes interrupt the narrative, and of which the most successful are a "song of scholars" and a "song of the blind," their rhythm is different and much more varied.

The fourteenth century also produced a long historical composition in verse, the *Rhymed Chronicle of Alfonso XI.* (died 1350), by Rodrigo Yanez, important fragments of which have come down to us; the versification of this chronicle is similar to that of Santob's *Proverbs* (strophes of four octosyllabic verses rhyming *abab*).

The word romance not only signifies in Spain, as in other Romanic countries, the vulgar tongue, but also bears the special meaning of a short epic narrative poem (historic ballad) or, at a later date, a short lyric poem. It is only at the close of the fifteenth century, and especially during the sixteenth, that the romances, which had previously passed from mouth to mouth by song and recitation, began to be written down and afterward to be printed.

In those collections the epic verse is always regarded as octosyllabic and printed as such; occasionally certain editions divide the romance into strophes of four verses (*cuartetas*). King Alfonso X. (died 1284), under whose patronage were published the memorable code entitled *Las Siete Partidas* and great scientific compilations, such as the *Libros de Astronomia* and the *Lapidario*, was also the founder of Spanish historiography in the vulgar tongue. Alfonso's example bore fruit. In the fourteenth century we find another *Crónica General de España* or *de Castilla*, and embracing the years 1030–1312; next, the *Grant Crónica de España* and the *Grant Crónica de los Conqueridores*, compiled by command of the grandmaster of the order of St. John of Jerusalem, Juan Fernandez de Heredia, about 1390. Special chronicles of each king of Castile were soon written. The four following reigns—those of Pedro I., Henry II., John I., and Henry III.—were dealt with by Pedro Lopez de Ayala. Several authors had a hand in the chronicle of John II., but the final redaction was by Fernan Perez de Guzman. The sad reign of Henry IV. was related by Diego Enriquez del Castillo and Alfonso de Pelencia, the glorious reign of the Catholic sovereigns Ferdinand and Isabella by Fernando del Pulgar and Andrès Bernaldes. Along with those royal chronicles must be mentioned some biographies of important persons. Thus in the fifteenth century the chronicle of Pedro Niño, count of Buelna (1379–1452), by Gutierre Diez de Gamez; that of Alvaro de Luna, constable of Castile (died 1453); also a very curious book of travels, the narrative of the embassy sent by Henry III. of Castile to Timur in 1403, written by the head of the mission, Ruy Gonzalez de CLAVIJO, (*q.v.*)

The other productions of Castilian prose in the thirteenth and fourteenth centuries are for the most part didactic and sententious compositions, which, however, contain illustrations or tales of Eastern origin. The best known is the collection of tales, many of them borrowed from Oriental sources, entitled *El Conde Lucanor,* but besides this contribution to light literature, the infant Juan Manuel wrote graver and more specially instructive works, notably the *Libro de los Estados* or *Libro del Infante*, a kind of manual of education, domestic economy, and politics; the *Libro del Caballero é del Escudero*, a practical treatise on chivalry somewhat resembling a work of Raymond Lully on the same subject. The knowledge of antiquity, previously so poor and vague, made remarkable progress in the fourteenth century. While the Carlovingian cycle is mainly represented in Spain by romances, of which the oldest seem to be fragments of lost poems of the *juglares*, the British cycle (Lancelot, Tristram, Merlin, etc.) is represented almost exclusively by works in prose. The principal French romances of the Round Table were translated and imitated in Spain and in Portugal as early as the first half of the fourteenth century at least; of that there is no doubt.

The first half of the fifteenth century, or, what comes almost to the same thing, the reign of John II. of Castile (1407–1454), is as regards its literature characterized by three facts—(1) by the development of a court poetry, artificial and pretentious; (2) by the influeuce of Italian literature on Castilian prose and poetry, the imitation of Boccaccio and Dante, especially of the latter, which introduced into Spain a liking for allegory; and (3) by more assiduous intercourse with antiquity—a fuller understanding of the Latin writers who had been brought to the front by the Italian renaissance. The most celebrated *cancionero* of the fifteenth century is that compiled for the amusement of his sovereign by Alfonso de Baena. After Baena's collection may be mentioned the *Cancionero de Stuñiga*, which contains the Castilian poems of the trobadores who followed Alfonso V. of Aragon to Naples. The earliest *Cancionero General* is that compiled by Juan Fernandez de Constantina, which appears to have issued from the Valencia press in the very beginning of the sixteenth century; the second, much better known, was published for the first time at Valencia in 1511; its editor was called Fernando del Castillo. The other poetic school of the fifteenth century, which claims to be specially related to the Italians, had as its leaders Juan de Mena, and the marquis of Santillana, D. Iñigo Lopez de Mendoza. The marquis of Santillana occupies a considerable place in the literature of the fifteenth century, not only by reason of his poems, but quite as much if not more through the support he afforded to all writers of his time, and the impulse he gave to the study of antiquity and to the labors of translators who at his request turned Virgil, Ovid, Seneca, etc., into Castilian. With the exception of the chronicles and some *caballarias*, the prose of the fifteenth century contains nothing very striking.

The ancient liturgical Spanish theater is known to us only by fragments of the play of the *Magian Kings*, of which mention has already been made; but certain regulations of the code of the *Siete Partidas* (compiled between 1252 and 1257) prove that this theater existed, and that at the great festivals, such as Christmas, Epiphany, and Easter, dramatic representations were given in church. There is no need to linger over certain attempts at tragedy of the ancient type by Geronimo Bermudez (born 1530), Cristóbal de Virues (born about 1550), Lupercio Leonardo Argensola (1562–1613), etc., the only successful specimen of which is the *Numancia* of Cervantes; these works in fact, cold and manneristic, mere exercises in style and versification, remained without influence on the development of the Spanish stage.

The golden age of Spanish literature, as it is called, belongs to the sixteenth and seventeenth centuries, extending approximately from 1550 to 1650. Previous to the reign of the Catholic sovereigns there exists, strictly speaking, only a Castilian literature, not very self-reliant and largely influenced by imitation first of France and then of Italy; the union of the two crowns of Aragon and Castile, and afterward the advent of the house of Austria and the king of Spain's election as emperor, proved the creation at once of the political unity of Spain and of Spanish literature. In the sixteenth and seventeenth centuries the literature is eminently national. Of course all is not equally original, and in certain kinds of literature the Spaniards continue to seek models abroad.

Lyric poetry, especially that of the highest order, is always inspired by the Italian masters. An irresistible tendency leads the Spanish poets to rhyme in hendecasyllabics—as the marquis of Santillana had formerly done, though his attempts had fallen into oblivion—and to group their verses in tercets, octaves, sonnets, and *canciones* (*canzoni*). Garcilaso de la Vega (1503–1536), Juan Boscan (1493–*c.* 1550), and Diego de Mendoza (1503–1575) are the recognized chiefs of the school *al italico modo*, and to them belongs the honor of having successfully transplanted to Spain those different forms of verse, and of having enriched and improved the poetic language of their country. The seventeenth century, it may be said, is characterized by a regular surfeit of lyric poetry, to which the establishment of various literary academies in the Italian style contributed not a little. Of this enormous mass of verses of all sorts and sizes very little still keeps afloat: the names of three-fourths of the versifiers must be forgotten, and in addition to those already cited it will be sufficient to mention Luis de Góngora (1561–1626) and Francisco de Quevedo Villegas (1580–1645). Another commonplace of Spanish poetry at this period was epic poetry after the style of Tasso's *Gerusalemme*. In burlesque poetry the Spaniards have been rather more successful; *La Gatomaquia* of Lope de Vega and *La Mosquea* of Villaviciosa (died 1658) are somewhat agreeable pieces of fun.

The departments of imaginative literature in which the genius of the new Spanish nation revealed itself with most vigor and originality are the *novela* and the drama. By *novela* must be understood the novel of manners, called *picaresca* because of the social status of the heroes of those fictions; and this kind of novel is quite an invention of the Spaniards. Their pastoral romance, on the other hand—the best known examples of which are the *Diana Enamorada* of Jorge de Montemayor (died 1561), continued by Alonso Perez and Gaspar Gil Polo, the *Galatea* of Cervantes, and the *Arcadia* of Lope de Vega, as well as their novel of adventure, started by Cervantes in his *Novelas Ejemplares* (1613), and cultivated after him by a host of writers—is directly derived from Italy.

By degrees the picaresque romance was combined with the novel of Italian origin and gave rise to a new type—half novel of manners, half romance of adventure—of which the characteristic example appears to be the *Relacion de la Vida y Adventuras del Escudero Marcos de Obregon* (1618), by Vicente Espinel, one of the most genial and best written works of the seventeenth century. Among the so-called historical romances one only deserves to be mentioned—the *Guerras Civiles de Granada* by Gines Perez de Hita, which deals with the last years of the kingdom of Granada and the insurrection of the Moors of the Alpujarras in the time of Philip II. *Don Quixote*, the masterpiece of Miguel Cervantes de Saavedra (1547–1616), is too great a work to be treated along with others; and, besides, it does not fall strictly within the limits of any of the classes just mentioned. If it has to be defined, it may be described as the social romance of sixteenth and seventeenth century Spain. The same thing happened to *Don Quixote* which had happened to *Guzman de Alfarache*. After the publication of the first part (1605), Cervantes allowed his pen to lie too long idle; and so it occurred to some one to anticipate him in the glory of completing the story of the heroic deeds of the knight of La Mancha. In 1614 a second part of the adventures of Don Quixote made its appearance—the work of a certain Avellaneda, a pseudonym under which people have sought to recognize the inquisitor Luis de Aliaga. Cervantes was thus roused from inactivity and the following year gave to the world the true second part, which soon effaced the bad impression produced by Avellaneda's heavy and exaggerated imitation.

The stage in the seventeenth century in some measure took the place of the romances of the previous age; it is, as it were, the medium of all the memories, all the passions, and all the aspirations of the Spanish people. Its style, being that of the popular poetry, made it accessible to the most illiterate classes, and gave it an immense range of subject. From the books of the Bible, the acts of the martyrs, national traditions, the chronicles of Castile and Aragon, and foreign histories and novels, down to the daily incidents of contemporary Spanish life, the escapades and nightly brawls of students, the gallantries of the Calle Mayor and the Prado of Madrid, balcony escalades, sword thrusts and dagger strokes, duels and murders, fathers befooled, jealous ladies, pilfering and cowardly valets, inquisitive and sprightly waiting-maids, sly and tricky peasants, fresh country girls—all are turned to dramatic account. The enormous mass of plays with which the literature of this period is inundated may be divided into two great classes—a secular and a religious, the latter again subdivided into (1) the liturgical play, *i.e.*, the *auto* either *sacramental* or *al nacimiento*, and (2) the *comedia divina* and the *comedia de santos*, which have no liturgical element and differ from a secular play only in the fact that the subject is religious, and frequently, as one of the names indicates, derived from the history of a saint. In the secular drama, classification might be carried almost to any extent if the nature of the subject be taken as the criterion. As to the dramatic poets of the golden age, even more numerous than the lyric poets and the romancers, it is rather difficult to group them. All are more or less pupils or imitators of the great chief of the new school, Lope Felix de Vega Carpio (1562–1635); everything has ultimately to be brought back to him whom the Spaniards call the "monster of Nature."

His great and most incontestable merit is to have given the Spanish stage a range and scope of which it had not been previously thought capable, and of having taught his contemporaries to find dramatic situations and to carry on a plot. Fr. Gabriel Tellez (1570–1648), better known under the pseudonym of Tirso de Molina, one of the most flexible, ingenious, and inventive of the dramatists, displayed no less talent in the comedy of contemporary manners than in historical drama. Finally Juan Ruiz de Alarcon (died 1639), the most serious and most observant of Spanish dramatic poets, successfully achieved the comedy of character in *La Verdad Sospechosa*, closely followed by Corneille in his *Menteur*. The remaining play-writers hardly did anything but increase the number of the *comedias;* they added nothing to the real elements of the drama. The second epoch of the classical drama is represented mainly by Pedro Calderon de la Barca (1600–1681), the Spanish dramatist who has obtained most celebrity abroad, where his pieces have been studied and admired (perhaps extravagantly) by certain critics who have not feared to rank him with Shakespeare. It is Calderon who first made honor, or more correctly the point of honor, an essential motive in the conduct of his personages; it is he also who made the *comedia de capa y espada* uniform even to monotony, and gave the comic "part" of the *gracioso* (confidential valet of the *caballero*) a fixity which it never previously possessed. There is depth and poetry in Calderon, but vagueness also and much bad taste.

An attempt is now made to treat the history of Spain in the manner of Livy, Sallust, Tacitus, whose methods of narration were directly adopted. The sixteenth century, however, still presents certain chroniclers of the mediæval type, with more erudition, precision, and a beginning of the critical element. With Juan de Mariana (1536–1623) history ceases to be a mere compilation of facts or a work of pure erudition, in order to become a work of art and of thought. The *Historia de España* by the celebrated Jesuit, at first written in Latin in the interest especially of foreigners, was afterward rendered by its author into excellent Castilian; as a general survey of its history, well planned, well written, and well thought out; Spain possesses nothing that can be compared with it; it is eminently a national work, steeped throughout in the prejudices of the race. Various works of less extent—accounts of more or less important episodes in the history of Spain—may take their place beside Mariana's great monument; for example, the *Guerra de Granada* by Diego Hurtado de Mendoza (a history of the revolt of the Moors of the Alpujarras under Philip II.) written about 1572; the narrative of the expedition of the Catalans in the Morea in the fourteenth century by Francisco de Moncada (died 1635), etc. Each of these writers has been more or less inspired by some Latin author, one preferring Livy, another Sallust, etc. These imitations, it must be admitted, have something artificial and stilted. On the other hand, the historians of the wars of Flanders, such as Carlos Coloma, Bernardino de Mendoza, Alonso Vazquez, Francisco Verdugo, are less refined, and for that very reason are more vivid and more thoroughly interest us in that struggle of the two races, so foreign to each other and of such different genius. As for the accounts of the trans-Atlantic discoveries and conquests, they are of two kinds—either (1) memoirs of the actors or witnesses of those great dramas; or (2) works by professional writers, such as Francisco Lopez de Gomara—official historiographers who wrote in Spain on information sent to them from the newly-discovered lands.

Letter writers, a rather numerous body in Spanish literature, are nearly related to the historians; in fact, letters written to be read by others than the persons addressed, or in any case revised afterward, are only another method, a little more familiar, of writing history.

Philosophy is rather poorly represented in the sixteenth and seventeenth centuries in the literature of the vernacular. Lay moralists, however, are very numerous in the sixteenth and seventeenth centuries. Some write long and heavy treatises on the art of governing, the education of princes, the duties of subjects, etc. Pedro Fernandez de Navarrete's *Conservacion de Monarquias*, Diego de Saavedra Faxardo's *Idea de un Principe Cristiano*, Quevedo's *La Politica de Dios y Gobierno de Cristo*, give a correct idea of the ability which the Spaniards have displayed in this kind of didactic and preceptorial literature—ability of no high order, for the Spaniard, when he means to teach and work out a doctrine, loses himself in distinctions and rapidly becomes diffuse, pedantic, and obscure. But there is a kind of morality in which he indubitably excels, namely, in social satire, which, under all its forms—dialogue and dream in the style of Lucian, epistle after the manner of Juvenal, or pamphlet—has produced several masterpieces and a host of ingenious, caustic, and amusing compositions.

Spanish thought as well as public spirit and all other forms of national activity began to decline toward the close of the seventeenth century. The advent of the house of Bourbon, and the increasing invasion of French influence in the domain of politics as well as in literature and science, confirmed this decay by rendering abortive the efforts of a few writers who had remained faithful to the pure Spanish tradition. In the hands of the second-rate imitators of Calderon the stage sank ever lower and lower, lyric poetry, already compromised by the pomp and galimatias of Góngora, was abandoned to wretched rhymsters, who tried without success to make up by extravagance of style for meanness of thought. In a word, everything was suffering from anæmia. The first symptoms, not of a revival, but of a certain resumption of intellecual production, appear in the department of linguistic study.

The terrible struggle of the War of Independence (1808–1814), which was destined to have such important consequences in the world of politics, did not exert any immediate influence on the literature of Spain. One might have expected as a consequence of the rising of the whole nation against Napoleon that Spanish writers would have given up seeking their inspiration from those of France, and would have tried to resume the national traditions which had been broken at the end of the seventeenth century. But nothing of the sort occurred. Not only the *afrancesados* (as those were called who had accepted the new régime), but also the most ardent partisans of the patriotic cause, continued in literature to be the submissive disciples of France. And, when romanticism begins to find its way into Spain and to enter into conflict with the spirit and habits of the eighteenth century, it is still to France that the poets and prose writers of the new school turn, much more than either to England or to Germany. The first decidedly romantic poet of the generation which flourished about 1830 was the duke of Rivas, Angel de Saavedra (1791–1856); no one succeeded better in reconciling the genius of Spain and the tendencies of modern poetry. On the other hand, José de Espronceda (1808–1842), who has sometimes been called the Spanish Musset, savors much less of the soil than the duke of Rivas; he is a quite cosmopolitan romanticist of the school of Byron and the French imitators of Byron. José Zorrilla (born 1817) has a more flexible and exuberant but much more unequal talent. In the dramatic literature of this period it is also noticeable that the tragedy more than the comedy is modeled on the examples furnished by the French drama of the Restoration. One prose writer of the highest talent must be mentioned along with Espronceda, with whom he has in the moral aspect several features in common—namely, D. José de Larra (1809–1837), so famous by his pseudonym of "Figaro," with which he signed the greater number of his works. The most prominent literary critic belonging to the first generation of the century was Alberto Lista (1775–1848), whose critical doctrine may be described as a compromise between the ideas of French classicism and those of the romantic school.

If the struggle between classicists and romanticists continued even after 1830, and continued to divide the literary world into two opposing camps, it is plain that the new generation—that which occupied the scene from 1840 till about 1868—had other preoccupations. The triumph of the new ideas is now assured; only a few reactionaries are still seen to cling to the principles bequeathed by the eighteenth century. What was now being aimed at was the creation of a new literature which should be truly national and no longer a mere echo of that beyond the Pyrenees. To the question whether contemporary Spain has indeed succeeded in calling into existence such a literature, we may well hesitate to give an affirmative answer. It is true that in every species of composition, the gravest as well as the lightest, it can show works of genuine talent; but many of them are strikingly deficient in originality; all of them either bear unmistakable traces of imitation of foreign models, or show (more or less happily) the imprint of the older literature of the seventeenth century, to which the historical criticism of Duran and the labors of various other scholars had given a flavor of novelty. With this observation before him, the student can divide the authors of this period into two groups—the one composed of those who, won by modern ideas, are more or less liberal in politics, and draw their inspiration in all they write from France or from what they are able to assimilate of other literatures through France; the other consisting of ultra-conservatives, whose dream in every sphere—letters, art, and politics—is the restoration of the Spain of the past.

Catalan Literature.—Although the Catalan language is simply a branch of the southern Gallo-Roman, the literature, in its origin at least, ought to be considered as a mere appendix of that of Provence. Nay more, until about the second half of the thirteenth century there existed in the Catalan districts no other literature than the Provençal, and the poets of northeastern Spain used no other language than that of the troubadours.

The fifteenth century is the golden age of Catalan poetry. At the instigation and under the auspices of John I. (1387-1395), Martin I. (1395-1410), and Ferdinand I. (1410-1416), kings of Aragon, there was founded at Barcelona a consistory of the "Gay Saber," on the model of that of Toulouse, and this official protection accorded to poetry was the beginning of a new style much more emancipated from Provençal influence. It cannot be denied, indeed, that its forms are still of foreign importation, that the Catalan verse writers accept the prescriptions of the *Leys d'Amor* of Guillaume Molinier, and the names which they gave to their *cobles* (stanzas) are all borrowed from the same *art de trobar* of the school of Toulouse; but, a very noteworthy fact, their language begins to rid itself more and more of Provençalisms and tends to become the same as that of prose and of ordinary conversation. With Pere and Jaume March, Jordi de Sant Jordi, Johan de Masdovelles, Francesch, Ferrer, Pere Torroella, Pau de Bellviure, Antoni Vallmanya, and, above all, the Valencian Auzias March (died 1459), there flourished a new school, of which the éclat lasted till the end of the fifteenth century, and which, as regards the form of its versification, is distinguished by its almost exclusive employment of eight-verse *cobles* of ten syllables, each with "crossed" or "chained" rhymes (*cobla crohada* or *encadenada*), each composition ending with a *tornada* of four verses, in the first of which the "device" (*divis* or *senyal*) of the poet is given out.

The earliest prose works in Catalan are later indeed than the poems of the oldest Catalan troubadours of the Provençal school, not dating farther back than from the close of the thirteenth century, but they have the advantage of being entirely original; their language is the very language of the soil which we see appearing in charters from about the time of the accession of James I. (1213). This is true especially of the chronicles, a little less so of the other writings, which, like the poetry, have difficulty in escaping the influence of the more polished dialect of the country to the north of the Pyrenees. Its chronicles are the best ornament of mediæval Catalan prose. Four of them—that of James I., apparently reduced to writing a little after his death (1276) with the help of memoirs dictated by himself during his lifetime; that of Bernat Des Clot, which deals chiefly with the reign of Pedro III. of Aragon (1276-1286); that of Ramon Muntaner (first half of the fourteenth century), relating at length the expedition of the Catalan company to the Morea and the conquest of Sardinia by James II.; finally that of Pedro IV., *The Ceremonious* (1336-1387), genuine commentaries of that astute monarch, arranged by certain officials of his court, notably by Bernat Des Coll,—these four works are distinguished alike by the artistic skill of their narration and by the quality of their language; it would not be too much to liken these Catalan chroniclers, and Muntaner especially, to Villehardouin, Joinville, and Froissart.

We have chiefly translators and historians in the fifteenth century. Antoni Canals, a Dominican, who belongs also to the previous century, translates into Catalan Valerius Maximus and a treatise of St. Bernard; Bernat Metge, himself well-versed in Italian literature, presents some of its great masters to his countrymen, by translating the *Griselidis* of Petrarch, and also by composing *Lo Sompni* ("The Dream"), in which the influence of Dante, of Boccaccio, and, generally speaking, of the Italy of the thirteenth and fourteenth centuries, is very perceptible. To the list of authors who represent the leading tendencies of the literature of the fifteenth century we must add the name of Johanot Martorell, a Valencian, author of the celebrated romance of chivalry *Tirant lo Blanch.*

With the loss of political was bound to coincide that of literary independence in the Catalonian countries. Catalan fell to the rank of a patois and was written less and less; lettered persons ceased to cultivate it, and the upper classes, especially in Valencia, owing to the proximity of Castile, soon affected to make no further use of the local speech except in familiar conversation. The sixteenth century, in fact, furnishes literary history with hardly more than a single poet at all worthy of the name—Pere Serafí, some of whose pieces, in the style of Auzias March, but less obscure, are graceful enough and deserve to live; his poems were printed at Barcelona in 1565. Prose is somewhat better represented, but, to tell the truth, it is only the erudite who persist in writing in Catalan—antiquaries and historians like Pere Miguel Carbonell, compiler of the *Chroniques de Espanya* (1547), Francesch Tarafa, Pere Anton Beuter, also chroniclers, and some others not so well known. In the seventeenth and eighteenth centuries the decadence becomes still more marked.

In 1814 appeared the *Gramática y Apologia de la Llengua Cathalana* of Joseph Pau Ballot y Torres, which may be considered as marking the origin of a genuine renaissance of the grammatical and literary study of Catalan. Although the author avows no object beyond the purely practical one of giving to strangers visiting Barcelona for commercial purposes some knowledge of the language, the enthusiasm with which he sings the praises of his mother-tongue, and his appended catalogue of works which have appeared in it since the time of James I., sufficiently show that this was not his only aim. In point of fact the book, which is entitled to high consideration as being the first systematic Catalan grammar, written, too, in the despised idiom itself, had a great influence on the authors and literary men of the principality. Under the helping influence of the new doctrines of romanticism twenty years had not passed before a number of attempts in the way of restoring the old language had made their appearance, in the shape of various poetical works of very unequal merit. The movement spread from Catalonia into other provinces of the ancient kingdom of Aragon; the appeal of the Catalans of the principality was responded to at Valencia and in the Balearic Isles. Later, the example of Provence, of the *felibritge* of the south of France, accelerated still further this renaissance movement, which received official recognition in 1859 by the creation of the *jochs florals,* in which prizes are given to the best competitors in poetry, of whom some succeed in obtaining the diploma of *mestre en gay saber*. It is of course impossible to foresee the future of this new Catalan literature—whether it is indeed destined for that brilliant career which the Catalans themselves anticipate. In spite of the unquestionable talent of poets like Mariano Aguiló (Majorca), Teodoro Llorente (Valencia), and, among the younger of them, Jacinto Verdaguer (Catalonia), author of an epic poem *Atlantída* and of very fascinating *Cants Mistichs*, it is by no means certain that this generation will be succeeded by another to follow in its footsteps, or that such a restoration of a provincial literature has much chance of permanence at the very moment when all the peoples of Europe are tending rather toward unity and centralization in the matter of language.

SPALATIN, GEORGE. George Burkhardt, a subordinate figure of some interest in the history of the Reformation in Germany, was born on January 17, 1484, at Spalt (whence he assumed the name Spalatinus), about 25 miles from Nuremberg. He died January 16, 1545, at Altenberg.

SPALATO (Slav. *Split*), a city of Dalmatia, at the head of one of the thirteen departments (area 730 square miles; population in 1880 31,003), is situated on the seaward side of a peninsula lying between the Gulf of Braza and the Gulf of Salona.

SPALDING, a market-town of Lincolnshire, England, in the Parts of Holland, is situated on the river Welland, and on the Great Northern and Great Eastern railways, ninety-three miles from London. The population in 1871 was 9,111, and in 1881, 9,260.

SPALDING, WILLIAM, logician and literary historian, was born in Aberdeen, Scotland, in 1809. After a thorough education at the grammar school and at Marischal College there, he came to Edinburgh in 1830, where he was called to the bar in 1833. His attempts to gain a legal practice not proving successful, he became a candidate in 1838 for the chair of rhetoric in Edinburgh university, which he held till 1845, when he was appointed professor of logic in the university of St. Andrews. He held the latter post till his death on November 16, 1859.

SPALLANZANI, LAZARO, is one of the most important and certainly also one of the most picturesque figures in the history of science during the eighteenth century. Born at Scandiano in Modena in 1729, he was at first educated by his father, who was an advocate. In 1754 he became professor of logic, metaphysics, and Greek in the university of Reggio, and in 1760 was translated to Modena, where he continued to teach with great assiduity and success, but devoted his whole leisure to natural science. He declined many offers from other Italian universities and from St. Petersburg until 1768, when he accepted the invitation of Maria Theresa to the chair of natural history in the university of Pavia, which was then being reorganized. He died from an apoplectic seizure, in 1799, at the age of 70.

SPANDAU, a strongly-fortified town in the province of Brandenburg, Prussia, is situated at the confluence of the Haval and Spree, eight miles to the northwest of Berlin. It has recently been converted into a fortress of the first class, and is now the key of the defenses of the capital. The population in 1885, including the garrison of nearly 4,000 men, was 31,463.

SPANGENBERG, AUGUST GOTTLIEB, Count Zinzendorf's successor, and bishop of the Moravian Brethren, was born July 14, 1704, at Klettenberg, on the south of the Harz mountains, and died in 1792.

SPARROW (A. S. *Spearwa;* Icel. *Spörr;* Old High Germ. *Sparo*), a word perhaps (like the equivalent Latin *Passer*) originally meaning almost any small bird, but gradually restricted in signification and nowadays in common English applied to only four kinds, which are further differentiated as Hedge-Sparrow, House Sparrow, Tree-Sparrow, and Reed-Sparrow—the last being a BUNTING—though when used without a prefix the second of these is usually intended.

1. The HEDGE-SPARROW, called "Dunnock" in many parts of Britain, the *Accentor modularis* of ornithologists, is the little brown-backed bird with an iron-gray head and neck that is to be seen in nearly every garden throughout the country, unobtrusively and yet tamely seeking its food, which consists almost wholly of insects, as it progresses over the ground in short jumps, each movement being accompanied by a slight jerk or shuffle of the wings. The taxonomic position of the genus is regarded by some systematists as doubtful; but to the writer there seems no good reason for removing it from the group which contains the Thrushes and Warblers (*Turdidæ* and *Sylviidæ*), to which it was long referred.

2. The HOUSE-SPARROW, the *Fringilla domestica* of Linnæus and *Passer domesticus* of modern authors, is far too well known to need any description of its appearance or habits, being found, whether in country or town, more attached to human dwellings than any other wild bird. Whether indeed in the older seats of civilization the House-Sparrow is not decidedly injurious to the agriculturist and horticulturist has long been a matter of discussion, and no definite result that a fair judge can accept has yet been reached. It is freely admitted that the damage done to growing crops is often enormous, but as yet the service frequently rendered by the destruction of insect pests cannot be calculated.

3. The TREE-SPARROW, the *Fringilla montana* of Linnæus and *Passer montanus* of modern writers, in appearance much resembling the House-Sparrow, but easily distinguishable by its reddish-brown crown, the black patch on the sides of its neck, and its doubly-barred wings, is a much more local species, in England generally frequenting the rows of pollard-willows that line so many rivers and canals, in the holes of which it breeds; but in some Eastern countries, and especially in China, it frequents houses, even in towns, and so fills the place of the House-Sparrow. Its geographical distribution is extensive, and marked by some curious characteristics, among which may be mentioned that, being a great wanderer, it has effected settlements even in such remote islands as the Færoes and some of the Outer Hebrides.

SPARROWHAWK. See HAWK.

SPARTA, after Athens, was the most powerful and important of the Greek states. Her fame rested mainly on her soldiers, her military discipline, her somewhat narrow patriotism, and her intense political conservatism; in general intellectual culture, in art and in everything connected with it, she was immeasurably inferior to Athens, and even to some of the other Greek states, though there is evidence to show that a genius and a taste for sculpture and music were by no means wanting to her citizens.

Sparta was not so much a city as a cluster of open villages in a plain in the heart of Laconia, in the middle valley of the Eurotas, on the west bank of the river, between the ranges of Taygetus and Parnon, and built in part on the spurs of these mountains. Its situation was very picturesque: "hollow, lovely Lacedæmon" is Homer's description. Taygetus on the west rises to its greatest height of nearly 8,000 feet just above the city, with primeval forests on its lower slopes, Gythium, the chief port of Laconia, being thirty miles distant; nor was it built with anything like the compactness of an Athens or a Corinth. The houses for the most part stood in spacious gardens, an open air life being altogether to the Spartan taste, and well suited to the pleasant genial climate of the valley. The olive still grows to great perfection in the neighborhood, and the silk is said to be of particularly fine quality. The mountain ranges round the city gave it a very strong defensive position, and for a long period Sparta was without walls or fortifications, trusting exclusively to the prowess of her citizens till she was seriously menaced by the victorious Macedonians in the fourth century B.C. The city was never a very splendid one; the houses were plain and simple, and there seem to have been no public buildings of striking magnificence. There was the theater, still to be traced in huge quadrangular blocks of stone, and there were porticos and colonnades, and the chapels and tombs of Spartan heroes, such as Lycurgus, Leonidas, Brasidas. The site of the city has not been thoroughly investigated, but it is a question whether much remains worth bringing to light. What has hitherto been discovered is poor and disappointing.

Sparta's history, passing over her share in the prehistoric Trojan War under her king Menelaus, the brother of Agamemnon, begins with the legislation of Lycurgus in the ninth century B.C. By the year 600 B.C. Sparta was quite in the first rank of Greek states, and it was generally felt that she had a right to take the lead in Greek politics. In the sixth century she put down the tyrants, the heads of the democratic and popular party, in several Greek cities, and drove, for a time at least, the reforming and innovating Clisthenes from Athens. Sparta was the steady foe of democracy and popular government. The government was highly centralized; it was wholly in the hands of the Spartans, the Periœci having no share in it, though many of them may have themselves been land-owners, or at any rate have held land under Spartan landlords, and been well-to-do and prosperous. The Helots were farm laborers bound to the soil, slaves in every sense of the word, anything like self-respect being studiously made impossible for them. Spartans could put down a popular rising or a slave insurrection with cold-blooded cruelty, and in a panic following on an earthquake of unusual violence in 464 there was a deliberately-planned massacre of a multitude of Helots for the safety of Sparta, carried out and executed by Spartans in person. A calculating selfishness was a marked trait in Spartan character. Sparta seems always to have put her own interests before those of Greece, though she claimed to be the leading and representative Greek state.

In 491, when Greece was threatened with invasion by Persia, we find Athens appealing to Sparta and urging a complaint against the Æginetans as traitors to Greece for having given earth and water, the symbols of submission, to the emissaries of the great king. In 480 a Spartan admiral commanded the Greek fleet of Artemisium against Xerxes, and in the following year a Spartan general, Pausanias, commanded the united forces of Greece in the famous battle of Platæa. All this implies a distinct recognition of Sparta as the head of Greece. The Persian War over, Athens under Cimon and Pericles developed extraordinary energy and took Sparta's place. Sparta, indeed, seems to have retired upon her laurels, and it was not without reluctance and much urgent pressure that she embarked in the Peloponnesian War, which, after twenty-eight years of hard fighting, ended in the overthrow of the Athenian empire and the capture of Athens by Lysander in 405. The crushing blow of Ægospotami, in 405, which annihilated her fleet and left her defenseless, and the subsequent surrender of the city transferred the supremacy of Greece once more to Sparta, but not for much more than thirty years. All Sparta's worst qualities came out during this period; "autonomy," which had been her watchword throughout the war against Athens, became a dead letter under her rule; and the freedom of city life, so dear to a Greek, was crushed out under her officials and commissioners, whom she thrust on a number of Greek cities. Still more did she disgust all the better men of Greece by concluding, after a series of intrigues for her own selfish ends, a peace with Persia, in 387, known as the peace of Antalcidas, the Spartan, through whom it was negotiated. It was a dishonorable peace for Greece, as its effect was to facilitate Persian intervention in Greek affairs and make the king of Persia the arbiter of Greek disputes and differences. Meanwhile Athens was recovering herself; the tables were soon turned on Sparta, and her maritime power collapsed before the united action of Athens and Persia. In 371 came Sparta's crushing defeat at Leuctra, a blow from which she never really recovered, though her courage and military discipline long survived it. But her prestige was gone. Epaminondas carried the war into the heart of Laconia and penetrated to Sparta itself. His victory at Mantinea in 362 gave independence to Messene, and Sparta was now politically ignored by her old allies. From this time Sparta almost drops out of Greek history.

SPARTACUS, the leader of a formidable insurrection of slaves against Rome in the first century B.C., was a Thracian by birth, and perhaps a descendant of the kings of Panticapæum, whose name he bore. He served in the Roman army, but seems to have deserted, for we are told that he was taken prisoner and sold as a slave. Destined for the arena, he, with a band of his fellow-gladiators, broke out of a training-school at Capua and took refuge on Mount Vesuvius (73 B.C.). Here he maintained himself as a captain of brigands, his lieutenants being Crixus and Œnomaus, who, like himself, had been gladiators. Their numbers soon swelled through the accession of runaway slaves and desperadoes from the neighborhood. A hastily-collected force of 3,000 men under Claudius endeavored to besiege and starve out the rebels, but the latter clambered down the precipices and put the Romans to flight. Swarms of hardy and desperate men now joined the rebels. After several ineffectual attempts to subdue him he was defeated and slain at Petelia in 71 B.C.

SPECIES. In logic the term "species" is applied to any group of individuals agreeing in some common attribute or attributes, and, included along with other groups in a higher category, that of "genus," which comprehends the fewer and more general attributes in which all agree, and ignores those in which they differ. The application of these terms in logic is thus purely relative; any genus, however large, may be but a species of a still larger genus. But in arranging the innumerable objects of natural sciences the naturalist finds it necessary to restrict the terms "species" and "genus" to the two lowest groupings, and to distinguish the higher aggregates by special terms, as "family," "order," "class," etc. Early writers had but a loose conception of many different "kinds" of animals and plants, and spoke only of species and genus in their purely logical relations, with varying breadth of content. The term "species" was limited to its natural history usage in the end of the seventeenth century by John Ray.

SPECIFIC GRAVITY. See HYDROMETER.

SPECTACLES are flat glasses, prisms, spherical or cylindrical lenses, employed to detect and correct defects of the eyes. They are made usually of crown glass or rock crystal ("pebbles"), the latter being somewhat lighter and cooler to wear. They are mounted in the well-known rigid spectacle frame when for continuo use—eye-glasses being preferable where they are worn intermittently, and hand-glasses or lorgnettes where they are required to supplement temporarily the spectacles usually worn, or where, as with extreme shortness of sight, no glass could be employed with comfort for any length of time.

Preserves are used to conceal deformities or to protect the eyes in the many conditions where they cannot tolerate bright light, such as ulceration and inflammation of the cornea, certain diseases of the iris, ciliary body, choroid, and retina. They are made of bluish, "smoked," or almost black colored glass, and are of various shapes, according to the amount of obscuration necessary.

Prisms are of great value in cases of double vision due to a slight tendency to squinting, caused by weakness or over-action of the muscular apparatus of the eyeball. Prisms deflect rays of light toward their bases. Hence, if a prism is placed in front of the eye with its base toward the nose, a ray of light falling upon it will be bent inward, and seem to come from a point further out from the axis of vision. Conversely, if the base of the prism is turned toward the temple, the ray of light will seem to come from a point nearer the axis, and will induce the eye to turn inward, to converge toward its fellow. In cases of myopia, or short-sight, owing to weakness of the internal recti muscles, the eyes, in looking at a near object, instead of converging, tend to turn outward, and so double vision results. If a suitable prism is placed in front of the eyes the double vision may be prevented. Biconcave, biconvex, and concavo-convex (meniscus) lenses are employed in ophthalmic practice in the treatment of errors of refraction. Until recently these spherical lenses were numbered in terms of their focal length, the inch being used as the unit. Owing principally to differences in the length of the inch in various countries, this method had great inconveniences, and is now giving place to a universal system, in which the unit is the refractive power of a lens whose focal length is one meter. This unit is called a "dioptric" (usually written "D"). A lens of twice its strength has a refractive power of 2 D, and a focal length of half a meter, and so on.

Concave lenses are used in the treatment of myopia or short-sight. In this condition the eye is elongated from before backward, so that the retina lies behind the principal focus. All objects, therefore, which lie beyond a certain point (the conjugate focus of the dioptric system of the eye, the far point) are indistinctly seen; rays from them have not the necessary divergence to be focused in the retina, but may obtain it by the interposition of suitable concave lenses. Concave lenses should never be used for work within the far point; but they may be used in all cases to improve distant vision, and in very short-sighted persons to remove the far point so as to enable fine work, such as sewing or reading, to be done at a convenient distance. The weakest pair of concave lenses with which one can read clearly test types at a distance of eighteen feet is the measure of the amount of myopia, and this fully correcting glass may be worn in the slighter forms of short-sight. In higher degrees, where full correction might increase the myopia by inducing a strain of the accommodation, somewhat weaker glasses should be used for near work. In the highest degrees the complete correction may be employed, but lorgnettes are generally preferred, as they can be removed when the eyes become fatigued. It must be remembered that short-sight tends to increase during the early, especially the school, years of life, and that hygienic treatment, good light, good type, and avoidance of stooping, are important for its prevention.

Convex Lenses.—In hypermetropia the retina is in front of the principal focus of the eye. Hence in its condition of repose such an eye cannot distinctly see parallel rays from a distance and, still less, divergent rays from a near object. The defect may be overcome more or less completely by the use of the accommodation. In the slighter forms no inconvenience may result; but in higher degrees prolonged work is apt to give rise to aching and watering of the eyes, headache, inability to read or sew for any length of time, and even to double vision and internal strabismus. Such cases should be treated with convex lenses, which should be theoretically of such a strength as to fully correct the hypermetropia. Practically it is found that a certain amount of hypermetropia remains latent, owing to spasm of the accommodation, which relaxes only gradually. At first glasses may be given of such a strength as to relieve the troublesome symptoms; and the strength may be gradually increased till the total hypermetropia is corrected. Young adults with slighter forms of hypermetropia need glasses only for near work; elderly people should have one pair of weak glasses for distant and another stronger pair for near vision. These may be conveniently combined, as in Franklin glasses, where the upper half of the spectacle frame contains a weak lens, and the lower half, through which the eye looks when reading, a stronger one.

Anisometropia.—It is difficult to lay down rules for the treatment of cases where the refraction of the two eyes is unequal. If only one eye is used, its anomaly should be alone corrected; where both are used and nearly of equal strength, correction of each often gives satisfactory results.

Presbyopia.—Where distant vision remains unaltered, but, owing to gradual failure of the accommodative apparatus of the eye, clear vision within eight inches becomes impossible, convex lenses should be used for reading of such a strength as to enable the eye to see clearly about eight inches distance. Presbyopia is arbitrarily said to commence at the age of forty, because it is then that the need of spectacles for reading is generally felt; but it appears later in myopia and earlier in hypermetropia. It advances with years, requiring from time to time spectacles of increasing strength.

Cylindrical Lenses.—In astigmatism, owing to differences in the refractive power of the various meridians of the eye, great defect of sight, frequently accompanied by severe headache, occurs. This condition may be cured completely, or greatly improved by the use of lenses whose surfaces are segments of cylinders. They may be used either alone or in combination with spherical lenses. The correction of astigmatism is in many cases a matter of considerable difficulty, but the results to vision almost always reward the trouble.

SPECTROSCOPY. The spectroscope is an instrument which separates luminous vibrations of different wave-lengths, as far as is necessary for the object in view. It consists of three parts,—the collimator, the prism or grating, and the telescope. The collimator carries the slit through which the light is admitted and a lens which converts the diverging pencil of light into a parallel pencil. The pencils carrying light of different wave-lengths are turned through different angles by the prism or grating, which is therefore the essential portion of the spectroscope. The telescope serves only to give the necessary magnifying power, and is dispensed with in small direct vision spectroscopes. For a description of the different kinds of prism used, see OPTICS; and for an explanation of the action of the grating, see UNDULATORY THEORY. The most important adjustment in the spectroscope is that of the collimator. Especially in instruments of large resolving power it is essential for good definition that the light should enter the prism or fall on the grating as a parallel pencil.

Prisms are nearly always used in the position of minimum deviation, but, if the collimator is properly adjusted, this is by no means a necessary condition for good definition. Prisms, as generally cut, with an isosceles base, give the greatest resolving power in the position of minimum deviation, but the loss in resolving power is not great for a small displacement. The dispersion and magnifying power of a prism can be considerably altered by a change of its position, and a knowledge of this fact is of great value to an experienced observer. The use of a prism in a position different from that of minimum deviation is, however, a luxury which only those acquainted with the laws of optics can indulge in with safety.

The theory of the spectroscope is given and shows on what its resolving power depends. There is no connection between resolving power and dispersion, any value of resolving power being consistent with any value of dispersion. To obtain large resolving power with small dispersion requires, however, the use of inconveniently large telescopes and prisms or gratings. It is easy, on the other hand, to obtain small resolving power together with large dispersion.

The following definitions would be found of general use if adopted. *Resolving Power.*—The unit resolving power of a spectroscope in any part of the spectrum is that resolving power which allows the separation of two lines differing by the thousandth part of their own wave-length or wave-number—the wave-number being the number of waves in unit length. *Purity.*—The unit purity of a spectrum is that purity which allows the separation of two lines differing by the thousandth part of their own wave-length or wave-number. We speak of the resolving power of a spectroscope and of the purity of a spectrum. The resolving power is a constant for each spectroscope, and independent of the width of the slit. The purity of a spectrum, on the other hand, depends on the width of the slit, unless that width is small compared to a certain quantity presently to be mentioned. The resolving power of a spectroscope is numerically equal to the greatest purity of spectrum obtainable by it.

There is a necessary limit to the resolving power of all optical instruments, depending on the fact that light consists of a series of groups of waves incapable of interfering with each other. If it is true, as is generally believed, but without sufficient reason, that a retardation of 50,000 wave-lengths is sufficient to destroy the capability of interference—that is to say, that the groups consist on the average of approximately 50,000 waves—the maximum purity obtainable in any spectroscope is 50. The closest line resolved with a grating, requires a resolving power of about 100. Professor Piazzi Smyth has with prisms realized a purity of 50. It would seem, therefore, that the theoretical limit of purity has very nearly been reached, for, though the estimate of 50,000 waves to the group is in all probability too small, there are other considerations which render it highly improbable that the total number of waves to the group should, for sunlight at any rate, be more than two or three times larger. The limit of possible purity will very likely depend on the temperature of the luminous body.

Almost the greatest practical difficulty which the spectroscopist has to contend with generally is the want of sufficient light. The question of illumination is important also when photography is used for spectroscopic analysis. For a given intensity of the source of light the intensity of the image on the sensitive film will be directly proportional to the solid angle of the cone of light forming the last image, and will be independent of the arrangement of intermediate lenses. Hence lenses with as short a focus compared to aperture as is consistent with good definition should be used in the camera. A lens is often used to concentrate the light of the source on the slit. There is some loss of light due to reflection from the surface of the lens, but its position, aperture, and focal length do not affect the luminosity of the spectrum seen as long as the whole collimator is filled with light.

Bodies are rendered luminous for spectroscopic investigation either by being placed in the Bunsen flame or by the help of the electric current. A little difficulty may arise where the body is given in solution and does not show its characteristic lines in the flame.

The spectrum of a body is due to periodic motion within the molecules. If we are justified in believing that the molecule of mercury vapor contains a single atom, it follows that atoms are capable of vibration under the action of internal forces, for mercury vapor has a definite spectrum. We may consider, then, the spectrum to be determined in the first place by forces within the atom, but to be affected by the forces which hold together the different atoms within the molecule. The closer the bond of union the greater the dependence of the vibrations on the forces acting between the different atoms. Experimental evidence seems to favor these views, for we observe that whenever elements are loosely bound together we can recognize the influence of each constituent, while in the compounds which are sufficiently stable to resist the temperature of incandescence the spectrum of the compound is perfectly distinct from the spectra of the elements. The oxides and haloid salts of the alkaline earths, for instance, have spectra in which we cannot trace the vibrations of the component atoms; but the spectra of the different salts of the same metal show a great resemblance, the bands being similar and similarly placed. The spectrum seems displaced toward the red as the atomic weight of the haloid increases. No satisfactory numerical relationship has, however, been traced between the bands. The number of compounds which will endure incandescence without decomposition is very small, and this renders an exhaustive investigation of the relationship between their spectra very difficult.

Various efforts have been made to connect together the spectra of different elements. In these attempts it is generally assumed that certain lines in one spectrum correspond to certain lines in another spectrum, and the question is raised whether the atom with the higher atomic weight has its corresponding lines more or less refrangible. No definite judgment can as yet be given as to the success of these efforts.

When metallic spectra are examined it is often found that some line appears to belong to more than one metal. This is often due to a common impurity of the metals; but such impurities do not account for all coincidences. The question has been raised whether these coincidences do not point to a common constituent in the different elements which show the same line. If this view is correct, we should have to assume that the electric spark decomposes the metals, and that the spectrum we observe is not the spectrum of the metal, but that of its constituents. Further investigation has shown, however, that in nearly all cases the assumed coincidences were apparent only. With higher resolving powers it was found that the lines did not occupy exactly the same place. With the large numbers of lines shown by the spectra of most of the metals, some very close coincidences must be expected by the doctrine of chances. The few coincidences which our most powerful spectroscopes have not been able to resolve are in all probability accidental only.

SPEECH-SOUNDS, the sounds actually used for the conveyance of thought by speech. See PHONETICS.

Symbolization.—It is necessary to have some system of writing speech-sounds, in order to talk of them. Speech-sounds result from shocks given to the air by the organs of speech, received by the drumskin of the ear, and transmitted to the auditory nerves in the cochlea. The apparatus is explained by Helmholtz, who deals with musical sounds. But speech is not musical, and its sounds are much obliterated when rendered musical. An original quality of tone generated by the vocal chords is modified by the cavities through which it passes, as explained by Helmholtz (*Sensations of Tone*) on the principle of resonance. There are three ways in which speech-sounds may be produced—(1) by the air in the mouth, without additional breathing, by smacks and clicks; (2) by drawing in air, as orally in chirps, whistles, sobs, gasps, and nasally in snuffles, snores; (3) by expelling air, as in the greater number of speech-sounds. The last are either *flated*, the vocal chords being wide apart and hence not vibrating, but allowing breath to pass freely, or *voiced*, the vocal chords being close together and vibrating fully, or else *whispered*, the vocal chords approximating but not touching, and their edges only vibrating. The last is only a variation of the second and needs no further consideration. Flated and voiced sounds are either *fixed*, the position of the vocal organs remaining unchanged throughout, or *changing*, the position constantly altering from one fixed position to another, forming "glides."

Fixed speech-sounds, intended to be the same, vary from speaker to speaker, and in the same speaker at different times. Those who attempt to write sounds from dictation rapidly find that they have to disregard these specific differences, and simply discriminate genera. And much difference of opinion has always existed as to the discrimination and number of genera.

Vowels, that is, *vocals*, are so called because their positions allow the voice-sounds to pass with least obstruction. The three genera (ii, aa, uu), which have always been distinguished, differ greatly in the positions of the tongue and lip, that is, in their mouth cavities, and hence resonance. The usual method of describing speech-sounds is by the shape of the cavity, which, however, could be shown to be insufficient for many reasons. As differently shaped cavities resound to a note of the same pitch, Helmholtz proposed the last for discrimination. The pitches of (ii, aa, uu) are widely different, (ii) having the highest and (uu) the lowest; but the extreme diversity of results in attempting to assign the actual pitch of vowel cavities shows that this will not suffice. Resonance cavities do not create but merely modify original vowel qualities of tone, and these last seem to depend upon the will of the speaker, guided by his powers of appreciation and imitation, both extremely variable, partly hereditary, partly depending on conformation of brain, and partly acquired during adolescence.

Generally several syllables form a single word, and in many languages—by no means all languages—one syllable in a word is rendered conspicuous. Several plans have been adopted for this purpose. (1) Quantity or length of syllables, which seems to be all that is known of modern Indians, Arabs, and Persians. (2) Heightened or lowered or descending gliding pitch (*con portamento*) of one syllable, which were the acute, grave, and circumflexed syllables of Sanskrit, Latin, and Greek, the position of these syllables in a word there depending partly on the quantity of the syllables and partly on sense; this pitch difference remains in a more complicated form in Norwegian and Swedish. (3) Greater force given to one syllable; this is the English, German, and Italian "stress," and from the end of the third century A.D., when the feeling for quantity faded, was used instead of high pitch in Latin and Greek. The modern Italian and modern Greek as a general rule preserve the memory of the syllable which had the high pitch by giving it greater force, with but few exceptions, as Italian *cade·re ri·dere*, to fall, to laugh. (4) By a peculiar pronunciation, as the "catch" of the Danes. In French none of these methods seem to be consciously adopted. Some declare that the last syllable (not counting mute *e*) *always* has the stress, others that it *never* has the stress; others, again, consider the stress to be intentionally even, and when altered to depend mainly on grammatical construction, while there is certainly a raised pitch, frequently toward the close of a phrase or sentence, but sometimes on a penultimate syllable. Turks and Japanese have also even stress. All these modes of rendering a syllable conspicuous are apt to be called "accent," the Latin translation of προσῳδία, the song added to the word, which properly apply to class (2) only. Where pitch accent prevailed there may have been also stress, but that stress was probably as little subject to strict rule as alteration of pitch is in English speech, where it undoubtedly exists, without properly affecting signification. Hence we may say roughly that in Latin and Greek pitch was fixed and stress free, but in English and German stress is fixed and pitch free.

What accent is to a word, emphasis is to a sentence. But there is this difference. Accent always falls on a fixed syllable of a word. Emphasis varies with the word to be made conspicuous. Emphasis does not consist merely in making the stressed syllable of a word louder. It depends upon a number of most subtle varieties of qualities of tone, length, and pitch of utterance, in short, of those tricks and wiles of speech which form the stock-in-trade of actors and orators. The same words will mean totally different things according to the place and nature of the emphasis used. Different nations emphasize differently. To an Englishman French emphasis is apt to seem placed on the wrong word.

Although musical accent does not exist in English, almost every county has its peculiar sing-song mode of utterance. And even among educated men the sing-song may frequently be heard in public speaking, or in declaiming poetry, or recitation, or reading aloud generally. For these things no invariable rule exists. But in England questions require the pitch of the voice to be raised, and affirmations to be lowered, toward the end of a clause. In Scotland the pitch is raised in both cases, so that to an Englishman a Scotchman seems to be always asking questions.

What is heard are sentences consisting of various fixed sounds cemented by gliding sounds, which act one on the other, and thus become greatly modified. To construct an alphabet it is necessary from this mass to separate the fixed elements and the changing glides, to crystallize them into symbols, and finally to make the value of those symbols known to the reader. The last cannot be done satisfactorily except by *viva voce* instruction, but much can be accomplished by a review of the relations of sounds, made dependent on the relations of the motions of the organs of speech by which they are produced. There is a preliminary difficulty in defining an element. Perhaps position, flatus, whisper, and voice are the only ultimate elements. But it is usual to be very lax. Thus (p, t, k) have position only, (f, s, sh, kh) position and flatus, (i, a.

w, z, zh, gh) position and voice. The analysis is therefore only into "proximate" and not "ultimate" elements.

SPEKE, JOHN CANNING, an eminent African explorer, who was the first European to cross Central Africa from north to south and to determine the existence and position of the great water basin from which the Nile proper issues full formed. He was born on May 4, 1827, in Somersetshire, England. Entering the Indian army in 1844, he served in Sir Colin Campbell's division in the Punjab campaigns, and acquired repute both as a military officer and as a sportsman and naturalist. When on furlough Captain Speke often advanced into unexplored portions of the Himalayas, and even crossed the frontier into Tibet; but his attention was at an early date turned to the great problems not of Asiatic but of African geography, and in 1854 he commenced his brief and brilliant African career by an expedition along with Captain Burton into Somali land, the incidents of which are narrated in *What Led to the Discovery of the Source of the Nile* (London, 1864). It was along with the same explorer that the expedition of 1857–59 was undertaken, in the course of which Captain Speke, leaving Captain Burton, unfortunately invalided, at Kazé, struck northward and reached the shores of Lake Victoria Nyassa in the neighborhood of a nullah, which he named Jordans after his birthplace. Convinced though he was that this lake belonged to the Nile system, he had no absolute proof to offer to the skepticism of his fellow-traveler and many stay-at-home geographers, until in 1863 he returned from another expedition along with Capt. James Augustus Grant, in which he struck the Nile at its exit from the lake, and proved its identity with the river of Egypt by following it most of the way down. Captain Speke was expected to hold a public discussion with Captain Burton as to certain disputed points in the history of his discoveries at the British Association in Bath (1864); but on the very morning (September 15th) fixed for the tournament he was killed by the accidental discharge of his own gun as he was crossing a fence while out shooting.

SPENCER, JOHN CHARLES SPENCER, THIRD EARL, better known by his courtesy title of Lord Althorp, had the good fortune to be acquainted, through his father's official position in the ministries of Pitt and Grenville, with both Pitt and Fox, and to be the confidential ally through his own sound judgment and political honesty, of the leaders of the Whig party immediately before and after the Reform Bill of 1832. He was born at Spencer House, London, on May 30, 1782, and sent to Harrow for his education when less than eight years old. In January, 1800, he took up his residence at Trinity College, Cambridge, and applied himself energetically to mathematical studies. Almost immediately after taking the degree of M. A., in June, 1802, he set out on a Continental tour, which was cut short, after he had passed some months in the chief cities of Italy, by the renewal of war. Through the influence of Pitt's government he was returned to parliament for the borough of Okehampton in Devonshire, in April, 1804, and although he vacated his seat in February, 1806, to contest the university of Cambridge against Lord Henry Petty and Lord Palmerston (when he was hopelessly beaten), he was reëlected in the same month for Okehampton, and rewarded with the emoluments of a lord of the treasury. At the general election in November, 1806, the freeholders of Northamptonshire selected him as their representative, and he continued to sit for the county until he succeeded to the peerage. Lord Althorp occasionally spoke in debate and always on the side of Liberalism, but from 1813 to 1818 he rarely entered the doors of the House of Commons.

In 1819, on his return to political life after the death of his wife, and for many years after that date, he pressed upon the attention of the House the necessity of establishing a more efficient bankruptcy court, and of expediting the recovery of small debts; and, although his name is not associated with the attainment of either of these objects, he saw both accomplished before 1825. During the greater part of the reign of George IV. the Whigs lost their legitimate influence in the state from their want of cohesion, but this defect was soon remedied when Lord Althorp was chosen their leader in the Lower House, and his capacity for the position was proved by experience. When Lord Grey's administration was formed at the close of 1830 the chancellorship of the exchequer, combined with the leadership of the House of Commons, was naturally intrusted to Lord Althorp, and to him more than to any other man, with the exception of the prime minister and the lord chancellor, may be attributed the success of the government measures. The budget, it is true, was a failure, but this misfortune was soon forgotten in the struggles over the Reform Bill. When the Bill was ready for introduction to the House of Commons its principles were expounded by Lord John Russell; but from the commencement of the protracted discussion over its details he had the assistance of Lord Althorp, and after some weeks of incessant toil, which the physique of Lord John Russell could not sustain any longer, the whole responsibility was cast on Lord Althorp.

The Reform Bill was carried at last, and popular instinct was right in assigning to the leader of the House a credit only second to that earned by Lord John Russell. After the dissolution the Whigs returned to power with augmented numbers; but differences soon showed themselves among both leaders and followers, and their majority crumbled away. The ministry of Lord Grey was shattered to pieces by difficulties over an Irish Coercion Bill, in which O'Connell thought that he had been unfairly treated. Although Lord Melbourne became premier (July 14, 1834), the fortunes of the ministry rested on Lord Althorp's presence in the House of Commons. The death of Lord Spencer on November 10, 1834, called his son to the Upper House, and William IV. took advantage of this event to summon a Tory cabinet to his side. The new Lord Spencer abandoned the cares of office and returned to country life with unalloyed delight. He died at Wiseton on October 1, 1845.

SPENCER, a city of Worcester county, Mass., is located near Spencer station on the Boston and Albany railroad twelve miles from Worcester. The city is the site of a large collection of manufacturing establishments, special reference being had to those engaged in the production of boots and shoes and woolen goods, such as satinets, men's furnishing goods, etc. In addition to these, there are foundries and machine shops, manufactures of water filters, clothing, lasts, carriages, boxes, etc., also grist and saw mills. The city contains two banks, one weekly and one monthly publication, three churches, an academy and high school, several hotels and stores. The population in 1890 was 8,747.

SPENER, PHILIPP JAKOB, "the father of Pietism," was born January 13, 1635, at Rappoltsweiler in Upper Alsace. He received his earliest education from his subsequent brother-in-law, Joachim Stoll, chaplain to the count of Rappoltstein, whose wife was Spener's godmother. After a brief stay in the grammar-school of Colmar, he entered the university of Strasburg in 1651 as a student of theology—living there with an uncle, and holding quite aloof from the student-life of the place. He devoted himself to philology, history, and philosophy, and won his degree of master (1653) by a disputation against the philosophy of Hobbes. He then became private tutor to the princes Christian and Charles of the Palatinate, and lectured in the university on philology and history. From 1659 to 1662 he visited the universities of Basel, Tübingen, and Geneva, and commenced the study of heraldry, which he pursued throughout his life. In Geneva especially his religious views and tendencies were turned in the direction of his subsequent Pietism. He returned to Strasburg in 1663, where he was appointed preacher without pastoral duties, with the right of holding lectures in the university. Three years afterward he was invited to become the chief pastor in the Lutheran church at Frankfort-on-the-Main. Immediately after his removal to Frankfort he commenced that line of pastoral work which issued in the movement called PIETISM, (*q.v.*) In 1686 he accepted the invitation to the first court chaplaincy at Dresden. But in 1691 the Saxon representative at Berlin induced the court of Brandenburg to offer him the rectorship of St. Nicolas in Berlin with the title of "consistorialrath." In Berlin Spener was held in high honor, though the tendencies of the court and the government officials were rather rationalistic than pietistic. One of the most important works of this period of his life was the foundation of the university of Halle (1691), which he directed. In 1695 the theological faculty of Wittenberg formally laid to his charge 264 errors, and only his death (February 5, 1705) released him from these fierce conflicts.

SPENNYMOOR, a market town of Durham, England. Within recent years it has increased with great rapidity owing to the production of coal and iron, and in 1865 it was formed into a market town under a local board of health. It possesses a town hall, a mechanics' institute and reading room, and two market halls. The population of the urban sanitary district (area 176 acres) in 1890 was 6,500.

SPENSER, EDMUND, Elizabethan poet, was born in London about the year 1552. The received date of his birth rests on a passage in sonnet lx. of the *Amoretti.* He speaks there of having lived forty-one years; the *Amoretti* was published in 1595, and described on the title page as "written not long since;" this would make the year of his birth 1552 or 1553. We know from the *Prothalamion* that London was his birthplace.

It is natural that a poet so steeped in poetry as Spenser should show his faculty at a very early age; and there is strong reason to believe that verses from his pen were published just as he left school at the age of sixteen or seventeen. Certain pieces, translations from Du Bellay and Petrarch; afterward included in a volume of poems by Spenser published in 1591, are found in a miscellany, *Theatre for Worldings*, issued by a Flemish Protestant refugee, John van der Noodt, on May 25, 1569. Little is known of Spenser's Cambridge career, except that he was a sizar of Pembroke Hall, took his bachelor's degree in 1572, his master's in 1576, and left Cambridge without having obtained a fellowship. Three years after leaving Cambridge, in 1579, Spenser issued his first volume of poetry, the *Shepherd's Calendar.*

Spenser was appointed secretary to the lord-deputy of Ireland in 1580, and was one of the band of adventurers who, with mixed motives of love of excitement, patriotism, piety, and hopes of forfeited estates, accompanied Lord Arthur Grey of Wilton to Ireland to aid in the suppression of Desmond's rebellion. Regret is sometimes expressed that the author of the *Faery Queen*, who ought to have been dreamy, meditative, gentle, and refined, should have been found in such company, and should have taken part in the violent and bloody scenes of Lord Grey's two years' attempt at "pacification."

Amid all the distractions of his public life in Ireland, Spenser seems to have proceeded steadily with the composition of the *Faery Queen.* Some years later still, when Spenser was settled at Kilcolman castle, Sir Walter Raleigh found him with three books of the *Faery Queen* completed, and urged him to come with them to London. London accordingly he revisited in 1589, after nine years' absence. There is a very pretty record of this visit in *Colin Clout's Come Home Again*, published in 1595, but written in 1591, immediately after his return to Kilcolman. The first three books of the *Faery Queen*, which were entered at Stationer's Hall on December 1, 1589, were published in 1590, and he was proclaimed at once with remarkable unanimity by all the writers of the time as the first of living poets.

From the first week of its publication the literary world has continued unanimous about the *Faery Queen*, except on minor points. None of our great poets has been welcomed with such universal acclaim and upheld without loss of favor through so many changes of fashion. When romanticism was at its lowest ebb Pope read Spenser in his old age with as much delight as in his boyhood.

After the publication of the *Faery Queen*, Spenser seems to have remained in London for more than a year, to enjoy his triumph.

Early in 1596 the second three books of the *Faery Queen* were entered in the register of Stationer's Hall; and in the course of the same year were published his *Four Hymns*, his *Prothalamion*, and his *Astrophel*, a pastoral lament for Sir Philip Sidney, which he dedicated to the countess of Essex.

That Spenser wrote more of the *Faery Queen* during the last two years of his life, and that the MS. perished in the sack of Kilcolman castle by the rebels may plausibly be conjectured, but cannot be ascertained. During those years he would seem to have been largely occupied with political and personal cares. He describes himself in the *Prothalamion* as a disappointed suitor at court. He drew up his *View of Ireland* in 1596, when he was in London, and from various circumstances it is evident that he had hopes of some kind from the favor of Essex. The *View*, with its urgent entreaty that Essex should be sent to Ireland, was entered at Stationer's Hall in April, 1598, but he did not obtain leave to publish it. Burghley, who had long stood in his way, died in August of that year, and next month Spenser was appointed sheriff of Cork. In October, Tyrone's rebellion broke out, and Spenser's house was sacked and burned. The poet himself escaped, and in December was sent to London with dispatches. Again he ventured to urge upon the queen his plan for the thorough "reformation" of Ireland. But his own end was near. On January 16, 1599, he died at Westminster, ruined in fortune, if not heart-broken, and was buried in Westminster Abbey, near his master Chaucer.

SPERMACETI is a solid waxy body found in special cavities in the head of the sperm whale (*Physeter macrocephalus*), where it is held in solution by sperm oil while the creature is in life. At a temperature of about 6° C. the solid matter separates in a crystalline condition, and when purified by pressure and treatment with weak solutions of caustic alkali it forms brilliant white crystalline scales or plates, hard but unctuous to the touch, and destitute of taste or smell. It is quite insoluble in water, very slightly affected by boiling alcohol, but easily dissolved in ether, chloroform, and car-on bisulphide. Spermaceti consists principally of cetin or cetyl palmitate—an ether composed of cetyl alcohol combined with palmitic acid. Spermaceti candles of definite size are employed as a standard for illuminants on account of the uniform steady light they afford. The substance is further used in the dressing of fabrics and in medicine and surgery, especially in cerates, bougies, ointments, and in cosmetic preparations For sperm oil, see Whale Oils.

SPEUSIPPUS, son of Eurymedon and Potone, is supposed to have been born about 407 B.C. He was bred in the school of Isocrates; but, when his maternal uncle, Plato, returned to Athens about 387, he yielded to his influence and became a member of the Academy. In 361, when Plato undertook his third and last journey to Sicily, Speusippus accompanied him. In 347 the dying philosopher nominated his nephew to succeed him as scholarch, and the choice was ratified by the school. Speusippus held the office for eight years, and died in 339 after a paralytic seizure. According to some authorities he committed suicide. There is a story that his youth was riotous, until Plato's example led him to reform his ways. In later life he was conspicuously temperate and amiable. He was succeeded by Xenocrates.

SPEY, a river in the north of Scotland, rises in the southeast of Inverness-shire from a small tarn called Loch Spey. After forming for about fifteen miles the boundary between Elginshire and Banffshire, it again enters the former county, through which it flows for about ten miles past Fochabers to the Moray Firth. In the earlier part of its course it is fed by a large number of mountain streams.

SPEZIA, a city of Italy, in the province of Genoa, fifty-six miles southeast of Genoa by the railway to Pisa, which has become since the unification of the kingdom one of the principal Italian ports and the seat of a great government arsenal. It is situated at the northwest angle of the Gulf of Spezia. A great breakwater, constructed about 1860, stretches across the gulf from Santa Maria Point to Santa Teresa Point for a distance of 7,220 feet; and the outer harbor to the southwest of the town, excavated in 1865 to a depth of thirty-two feet, has an area of 247 acres. The arsenal has a length of 3,937 feet and an average breadth of 2,460 feet. Some of the largest vessels of the Italian navy have been constructed at Spezia. As a commercial center Spezia suffers from the lack of railway communication with the interior—the range of the Apennines lying between it and the more productive regions of Northern Italy. The population of the city was 19,864 in 1881 (commune 30,732), and is now (1890) 23,000.

SPHEROMETER, an instrument for the precise measurement of the radius of a sphere or the thickness of a thin plate. The usual form consists of a fine screw moving in a nut carried on the center of a small three-legged table. The lower end of the screw and those of the table legs are finely tapered and terminate in hemispheres, so that each rests on a point. If the screw has two turns of the thread to the millimètre, the head is usually divided into 500 equal parts, so that differences of 0.001 millimètre may be measured without using a vernier. A vertical scale fastened to the table indicates the number of whole turns of the screw and serves as a fixed point for reading the divisions on the head. In order to measure the thickness of a plate the instrument is placed on a level plane surface and the screw turned until the point just touches; the exact instant when it does so is defined by a sudden diminution of resistance succeeded by a considerable increase. The divided head and scale are read; the screw is raised; the thin plate slipped under it; and the process is repeated. The difference between the two readings gives the required thickness. A contact-lever, delicate level, or electric contact arrangement may be attached to the spherometer in order to indicate the moment of touching more precisely than is possible by the sense of touch.

SPHINX, a hybrid creature of Egyptian and Greek art and mythology. In Egypt the sphinxes are colossal images of granite or porphyry, with a human head and breast and the body of a lion (wingless) lying down. The largest and most famous is that of Gizeh. The head of the sphinx is usually that of a man, but female heads are said to occur occasionally. From Egypt the figure of the sphinx passed to Assyria, where it appears with a bearded male head on cylinders; the female sphinx, lying down and furnished with wings, is first found in the palace of Esarhaddon, (seventh century B.C.) Sphinxes have been found in Phœnicia, one at least being winged and another bearded. In Asia Minor an ancient female sphinx, but wingless, stands on the sacred road near Miletus. Sphinxes of the usual Greek type (female heads with bodies of winged lions) are represented seated on each side of two doorways in an ancient frieze found by Sir Charles Fellowes at Xanthus in Lycia, and now in the British Museum. The same type appears on the early sculptures of the temple at Assus.

SPHYGMOGRAPH. See Vascular System.

SPICE ISLANDS. See Moluccas.

SPIDER. See Arachnida.

SPIKENARD, or Nard (Heb., *nērd;* Gr., νάρδος, from Sanskrit *naladwitha*, the change from "r" to "l" seeming to indicate that the word came through Persia), a celebrated perfume which seems to have formed one of the most durable aromatic ingredients in the costly unguents used by the Romans and Eastern nations. The ointment prepared from it ("ointment of pistic nard"), is mentioned in the New Testament (Mark xiv. 3–5; John xii. 3–5) as being "very costly," a pound of it being valued at more than 300 denarii (over $50).

SPINACH. See Horticulture.

SPINAL CORD. See Physiology. For the diseases affecting the spinal cord, see Ataxy (Locomotor), Paralysis, Pathology, and Surgery.

SPINEL. See Mineralogy and Ruby.

SPINELLO ARETINO, painter, the son of a Florentine named Luca, who had taken refuge in Arezzo in 1310 when exiled with the rest of the Ghibelline party, was born at Arezzo about 1330. Spinello was a pupil of Jacopo di Casentino, a follower of Giotto, and his own style was a sort of link between the school of Giotto and that of Siena. In the early part of his life he worked in Florence as an assistant to his master Jacopo, while painting frescoes in the church of the Carmine and in Sta. Maria Novella. Between 1360 and 1384 he was occupied in painting many frescoes in and near Arezzo, almost all of which have now perished. Spinello died at Arezzo about 1410.

SPINET. See Pianoforte.

SPINNING. See Yarn.

SPINOLA, Ambrogio Spinola, Marchese di, a celebrated general, belonged to a noble and wealthy Italian family, and was born at Genoa about 1571. After the siege of Ostend had languished for more than two years under the direction of the archduke Albert, Spinola, who, though not a soldier by profession, had seen something of campaigning during a season or two, came upon the scene as a condottiere and received charge of the works. He entered upon his task in October, 1603, and his courage and vigor were rewarded by the surrender of the place on September 20, 1604. During the next five years, until the conclusion of the armistice of 1609, he frequently encountered Maurice of Orange, but on the whole with undecisive results. In 1620 he was sent by Spain into the Palatinate of the Rhine, and took many places; in the following year, on the renewal of the war with Holland, he returned to the scenes of his earlier campaigns, where his principal exploits were the capture of Jülich in February, 1622, and of Breda after a ten months' siege in June, 1625. He died at Castel-Nuovo di Scrivia on September 25, 1630.

SPINOZA, Baruch, or, as he afterward signed himself, Benedict de Spinoza, philosopher, was born at Amsterdam on November 24, 1632. His parents belonged to the community of Jewish emigrants from Portugal and Spain who, fleeing from Catholic persecution in the peninsula, had sought refuge in the nearly emancipated Netherlands. The name, variously written De Spinoza, D'Espinoza, and Despinoza, probably points to the province of Leon as the previous home of the family; there are no fewer than five townships so called in the neighborhood of Burgos. Of the philosopher's parents nothing is known. Spinoza received his first training under the senior rabbi, Saul Levi Morteira, whose most promising pupil he soon became. Under Morteira he became familiar with the Talmud, and, what was probably more important for his own development, with the philosophical writings of Ibn Ezra and Maimonides, Levi ben Gerson, Chasdai Creskas, and other representatives of Jewish mediæval thought.

The impulse toward natural science which he had received from Van den Ende was strengthened by the reading of Descartes; he gave over divinity, we are told, to devote himself entirely to these new studies. His inward break with Jewish orthodoxy dated, no doubt, farther back—from his acquaintance with the philosophical theologians and commentators of the Middle Ages; but these new interests combined to estrange him still further from the traditions of the synagogue. He was seldomer seen at its services—soon not at all. The jealousy of the heads of the synagogue was easily roused. An attempt seems to have been made to draw from him his real opinions on certain prominent points of divinity. Anxious to retain so promising an adherent, and probably desirous at the same time to avoid public scandal, the chiefs of the community offered him a yearly pension of 1,000 florins if he would outwardly conform and appear now and then in the synagogue. But such deliberate hypocrisy was abhorrent to Spinoza's nature. Threats were equally unavailing, and accordingly, on July 27, 1656, Spinoza was solemnly cut off from the commonwealth of Israel.

He drew up a protest against the decree of excommunication, but otherwise it left him unmoved. From this time forward he disused his Hebrew name of Baruch, adopting instead the Latin equivalent, Benedictus. Like every Jew, Spinoza had learned a handicraft; he was a grinder of lenses for optical instruments, and was thus enabled to earn an income sufficient for his modest wants. His skill, indeed, was such that lenses of his making were much sought after, and those found in his cabinet after his death fetched a high price. It was as an optician that he was first brought into connection with Huygens and Leibnitz; and an optical *Treatise on the Rainbow*, written by him and long supposed to be lost, has been recently discovered and reprinted by Dr. Van Vloten. He was also fond of drawing as an amusement in his leisure hours; and Colerus had seen a sketch-book full of such drawings representing persons of Spinoza's acquaintance; one of them being a likeness of himself in the character of Masaniello.

Early in 1661 Spinoza removed to Rhijnsburg near Leyden, the headquarters of the Collegiant brotherhood. The house where he lived at Rhijnsburg is still standing, and the road bears the name of Spinoza Lane. Very soon after his settlement in his new quarters he was sought out by Henry Oldenburg, the first secretary of the Royal Society. Oldenburg became Spinoza's most regular correspondent—a third of the letters preserved to us are to or from him; and it appears from his first letter that their talk on this occasion was "on God, on infinite extension and thought, on the difference and the agreement of these attributes, on the nature of the union of the human soul with the body, as well as concerning the principles of the Cartesian and Baconian philosophies." Spinoza meanwhile concentrated his attention upon the *Ethics*, and we learn from the correspondence with his Amsterdam friends that a considerable part of book i. had been communicated to the philosophical club before February, 1663. It formed his main occupation for two or three years after this date.

In 1663 Spinoza removed from Rhijnsburg to Voorburg, a suburban village about two miles from The Hague. His reputation had continued to spread. From Rhijnsburg he had paid frequent visits to The Hague, and it was probably the desire to be within reach of some of the friends he had made in these visits—among others the De Witts—that prompted his change of residence. He had works in hand, moreover, which he wished in due time to publish; and in that connection the friendly patronage of the De Witts might be of essential service to him. The first years at Voorburg continued to be occupied by the composition of the *Ethics*, which was probably finished, however, by the summer of 1665. His treatise constitutes the first document in the modern science of Biblical criticism. It was published in 1670, anonymously, printer and place of publication being likewise disguised (*Hamburgi apud Heinricum Künraht*). The storm of opposition which it encountered showed that these precautions were not out of place. It was synodically condemned along with Hobbes' *Leviathan* and other books as early as April, 1671, and was consequently interdicted by the states-general of Holland in 1674; before long it was also placed on the Index by the Catholic authorities. But that it was widely read appears from its frequent reissue with false title-pages, representing it now as an historical work and again as a medical treatise. Controversialists also crowded into the lists against it. A translation into Dutch appears to have been proposed; but Spinoza, who foresaw that such a step would only increase the commotion which was so distasteful to him, steadily set his face against it. No Dutch translation appeared till 1693.

The same year in which the *Treatise* was published Spinoza removed from his suburban lodging at Voorburg into The Hague itself.

In 1673 Spinoza received an invitation from the elector palatine to quit his retirement and become professor of philosophy in the university of Heidelberg. The offer was couched in flattering terms, and conveyed an express assurance of "the largest freedom of speech in philosophy, which the prince is confident that you will not misuse to disturb the established religion." But Spinoza's experience of theological sensitiveness led him to doubt the possibility of keeping on friendly terms with the established religion, if he were placed in a public capacity. Moreover, he was not strong; he had had no experience of public teaching; and he foresaw that the duties of a chair would put an end to private research. For all these reasons he courteously declined the offer made to him. There is little more to tell of his life of solitary meditation. Consumption had been making its insidious inroads upon Spinoza for many years, and early in 1677 he must have been conscious that he was seriously ill. On Saturday, February 20th, he sent to Amsterdam for his friend Doctor Meyer. On the following day the Van der Spijcks, having no thought of immediate danger, went to the afternoon service. When they came back Spinoza was no more; he had died about three in the afternoon with Meyer for the only witness of his last moments. Spinoza was buried on February 25th. He was little more than forty-four years of age.

SPIRES (Germ. *Speyer* or *Speier*), the chief town of the Rhenish palatinate, Bavaria, and formerly a free imperial city, is situated on the left bank of the Rhine, at the mouth of the Speyerbach, twenty-one miles to the south of Worms. The principal streets are broad but irregular, and the general appearance of the town little corresponds to its high antiquity, owing to the fact that it was burned by the French in 1689. The only important ancient building that has survived the flames is the cathedral, a very large and imposing basilica of red sandstone, and one of the noblest examples of Romanesque architecture now extant. Of the Retscher, or imperial palace, so called because built after the model of the Hradschin at Prague, only a moldering fragment of wall remains. It was in this palace that the famous diet of Spires met in 1529, at which the Reformers first received the name of Protestants. The Altpörtel (alta porta), a fine old gateway of 1246, is a relic of the free imperial city. Among the modern buildings are several churches and schools, a museum and picture gallery, etc. Spires, although rebuilt in 1697, has never recovered from the cruel injuries inflicted by the French in 1689. Its trade is insignificant, although it still has a free harbor on the Rhine. The population in 1885 was 16,228.

SPIRITUALISM. The term "spiritualism" is used by philosophical writers to denote the opposite of materialism. It is also used in a narrower sense to describe the belief that the spiritual world manifests itself by producing in the physical world effects inexplicable by the known laws of nature. The belief in such occasional manifestations has probably existed as long as the belief in the existence of spirits apart from human bodies, and a complete examination into it would involve a discussion of the religions of all ages and nations. In 1848, however, a peculiar form of it, believed to be based on abundant experimental evidence, arose in America and spread there with great rapidity and thence over the civilized world. To this movement, which has been called "modern spiritualism," the discussion in the present article is confined. The movement began in a single family. In 1848 a Mr. and Mrs. Fox and their two daughters, living at Hydeville, Wayne county, N. Y., were much disturbed by unexplained knockings. At length Kate Fox discovered that the cause of the sounds was intelligent and would make raps as requested, and. communication being established, the rapper professed to be the spirit of a murdered peddler. An investigation into the matter seemed to show that none of the Fox family were concerned in producing the rappings; but the evidence that they were not concerned is insufficient, although similar noises had been noticed occasionally in the house before they lived there. It was, however, at Rochester, where the two Fox girls soon afterward went to live with a married sister (Mrs. Fish) that modern spiritualism assumed its present form, and that communication was, as it was believed, established with lost relatives and deceased eminent men. The presence of certain "mediums" was required to form the link between the worlds of the living and of the dead, and Kate Fox and her sister were the first mediums. Spiritualists do not as yet claim to know what special qualities in mediums enable spirits thus to make use of them. The earliest communications were carried on by means of "raps," or, as Mr. Crookes calls them, "percussive sounds." It was agreed that one rap should mean "no" and three "yes," while more complicated messages were—and are—obtained in other ways, such as calling over or pointing to letters of the alphabet, when raps occur at the required letters.

The idea of communicating with the departed was naturally attractive even to the merely curious, still more to those who were mourning for lost friends, and most of all to those who believed that this was the commencement of a new revelation. The first two causes have attracted many inquirers; but it is the last that chiefly gives to modern spiritualism its religious aspect. Many came to witness the new wonder, and the excitement and interest spread rapidly. "Spirit-circles" were formed in several families, and other mediums discovered, exhibiting phenomena of various kinds (see below). The interest in mesmerism and the phenomena of hypnotic trance, which was widely diffused at this time both in America and Europe (see MAGNETISM, ANIMAL), was favorable to the new idea. Information about other worlds and from higher intelligences was thought to be obtained from persons who could be put into the sleep-waking state, of whom Andrew Jackson DAVIS (*q. v.*) was in America the most prominent example. His work, *Nature's Divine Revelations* (New York, 1847), was alleged to have been dictated in "clairvoyant" trance. Many reputed "clairvoyants" developed into mediums. The movement spread like an epidemic. There is very little evidence to show that it arose anywhere spontaneously, but those who sat with the Foxes were often found to become mediums themselves and then in their turn developed mediumship in others. The mere reading of accounts of seances seemed to develop the peculiar susceptibility in some persons, while others, who became mediums ultimately, did so only after prolonged and patient waiting.

There seems to have been little practical interest in spiritualism in Europe till Mrs. Hayden, a professional medium from Boston, went there in 1852. It spread like wildfire within a few months of her arrival—its first development being in the form of a mania for table-turning, which seems to have prevailed all over Europe in 1853. Daniel Dunglas HOME (*q.v.*), the next medium of importance who appeared in London, went there from America in 1855. But it was at Keighley in Yorkshire that spiritualism as a religious movement first made any mark in England, and it was there that the first English spiritualistic periodical, the *Yorkshire Spiritual Telegragh*, was started in 1855. The extent to which the movement has spread and the present number of spiritualists are very difficult to estimate. The periodicals devoted to spiritualism may perhaps be taken to indicate the present state of the movement. There are in England two weekly newspapers, *Light* and *The Medium and Daybreak;* one of these has advertisements of Sunday meetings in sixty different towns and in eighty different rooms. The spiritualistic journals outside Great Britain number about 100, though probably only about a quarter of these are of any importance. Of these 30 are in English (26 published in America and 4 in the Australian colonies), 15 to 20 in French, and 6 in German. But nearly 40 are published in Spanish in Spain and in South America. Private circles which meet regularly are believed to be numerous in England; and there are numerous public and semi-public trance-speaking and clairvoyant mediums, especially among the miners in the north.

In the present article it is impossible to give an exhaustive catalogue of the phenomena and modes of communication of modern spiritualism. Many have not now appeared for the first time in history, though it is difficult to suppose any historical connection between the new developments and the old. Perhaps the most striking parallelism is that between the proceedings at modern seances and those connected with the later Greek oracles. The greater part of the phenomena may be divided into two classes. To the first and earliest developed class belong what may be called the physical phenomena of spiritualism—those, namely, which, if correctly observed and due neither to conscious or unconscious trickery nor to hallucination on the part of the observers, exhibit a force hitherto unknown to science, acting in the physical world otherwise than through the brain or muscles of the medium. The earliest of these phenomena were the raps already spoken of and other sounds occurring without apparent physical cause, and the similarly mysterious movements of furniture and other objects; and these were shortly followed by the ringing of bells and playing of musical instruments. Later followed the appearance of lights; quasi-human voices; musical sounds, produced, it is supposed, without instruments; the "materialization" or presence in material form of what seem to be human hands and faces, and ultimately of complete figures, alleged to be not those of any person present, and sometimes claimed by witnesses as deceased relatives; "psychography," or "direct writing and drawing," asserted to be done without human intervention; "spirit-photography," or photographing of human and other forms invisible to all but specially endowed seers; unfastening of cords and bonds; elongation of the medium's body; handling of red-hot coals; and the apparent passage of solids through solids without disintegration. The phenomena observed at Tedworth belong to this class. Somewhat similar was the Cock Lane ghost in 1762. A practice of causing heavily loaded tables to rise by "magic" seems to have existed among the German Jews in the seventeenth century. Kerner records movements of objects in connection with Madame Hauffe in 1825–28, and such movements also occurred in presence of the so-called electric girl in 1846. The second class of phenomena, which we may call the automatic, consists in table-tilting and turning with contact; writing, drawing, etc., through the medium's hand; convulsive movements and involuntary dancing; entrancement, trance-speaking, and personation by the medium of deceased persons, attributed to temporary "possession;" seeing spirits and visions and hearing phantom voices. This class bears affinity to some of the phenomena of hypnotism and of certain nervous complaints, to certain epidemics of the Middle Ages, and to phenomena that have occurred at some religious revivals. According to quotations given by Chevreul, the divining-rod was used at the end of the seventeenth century for obtaining answers to questions, as table-tilting now is. In a third class must be placed the cure of disease by healing mediums. This cannot well be treated apart from mesmeric healing and "faith cures" and "mind cures," and belongs to medical psychology.

At no period of the spiritualistic movement has the class of physical phenomena been accepted altogether without criticism. Most spiritualists know that much fraud in connection with them has been discovered—frequently by spiritualists themselves—and that the conditions favorable to obtaining them are often such as favor fraud. It is with a full knowledge of these difficulties in the way of investigation that they maintain that unmistakably genuine phenomena are of constant occurrence. Many volumes containing accounts of such phenomena have been printed, and appeal is often made to the mass of evidence so accumulated.

Among the proposed explanations of these phenomena that of hallucination need not detain us long. Sensory hallucination of several persons together who are not in a hypnotic state is a rare phenomenon, and therefore not a probable explanation. Moreover, it cannot be regarded as being generally applicable, partly because material traces of what occurs often remain, and partly because of the general agreement not only of all the witnesses but of all the senses as to what is perceived, as distinguished from what is inferred. Nevertheless something of the kind may occasionally have happened, especially at some of the seances of Home. If collective hallucination really occurs at seances, it is a very interesting fact, and deserves to be carefully studied.

What may broadly be called conjuring is, however, a much more probable explanation of most of the recorded phenomena; and in the vast majority of cases the witnesses do not seem to have duly appreciated the possibilities of conjuring, nor to have taken sufficient precautions to exclude it. Besides, not even a conjuror knows all the possibilities of his art and can describe in detail all the accidental circumstances which may on any particular occasion favor deception, and perhaps never exactly recur. We require, therefore, to know not only that the witness is careful and accurate but that he has allowed a sufficiently wide margin for the possibilities of conjuring; and some leading spiritualists do not allow this. It is often urged that mediums are not conjurors because they frequently fail, whereas "imposture can be reproduced at will," and because they can produce the phenomena in private rooms, and under conditions which exclude the possibility of conjuring. But the phenomena produced by mediums in private rooms would generally be uninteresting and unsuited to public performance, so that it would not pay a professional conjuror to practice them.

One of the possibilities to be allowed for is that of unusual muscular endowment in the medium. For instance, in 1851, the remarkable loud double raps occurring in the presence of the Fox girls, which in 1849 had puzzled several investigating committees at Rochester, were explained by Professors Flint, Lee and Coventry of Buffalo as produced by rapidly partially dislocating and restoring the knee and other joints. They stated that they had experimented with another lady who could do the same; and, challenged by Mrs. Fish, they tried some experiments with her and Margaretta Fox which strongly supported their view.

Besides the general arguments for supposing that the physical phenomena of spiritualism may be due to conjuring, there are two special reasons which gain in force as time goes on. (1) Almost every medium who has been prominently before the public has at some time or other been detected in fraud, or what cannot be distinguished from fraud except on some violently improbable hypothesis; and (2), although it is easy to devise experiments of various kinds which would place certain phenomena above the suspicion of conjuring, by eliminating the necessity for continuous observation on the part of the investigators, there is no good evidence that such experiments have ever succeeded.

But what chiefly interests spiritualists is the assurance of life and progress after death, and the moral and religious teaching which they obtain through automatic writing and trance-speaking. It was discovered very early in the movement that the accuracy of these communications could not always be relied on; but it is maintained by spiritualists that by the exercise of the reason and judgment, by prolonged acquaintance with particular communicating intelligences, and by proofs of identity with persons known to have been trustworthy on earth, it is possible to obtain valuable information from beings not infallible, but with the knowledge of spirit life superadded to their earthly experience. Still the agreement between communications so received has not been sufficiently great for anything like a universal spiritualistic creed to have been arrived at. In France the doctrine of successive reincarnations with intervals of spirit life promulgated by Allan Kardec (Léon Hippolyte Denisart Rivail) forms a prominent element of spiritualistic belief. This view has, however, made but little way in England and America, where the opinions of the great majority of spiritualists vary from orthodox Christianity to Unitarianism of an extreme kind. Probably it would be impossible to unite spiritualists in any creed, which, beside the generally accepted belief in God and immortality, should postulate more than the progress of the spirit after death, and the power of some of the dead to communicate with the living by means of mediums.

Spiritualism has been accused of a strong tendency to produce insanity; the charge, however, seems to be in the main a mistaken inference from the fact that the delusions of the insane not infrequently take the form of supposed converse with invisible beings. It is, however, probable that the spiritualistic theories of possession and obsession sometimes injure persons with incipient insane impulses, by weakening their sense of responsibility for these and their efforts to control them. Spiritualism has also been accused of fostering free love and other doctrines subversive of society. But this charge, too, has been made without adequate grounds; for, though certain spiritualistic bodies have at times taught such docrines, they have always been repudiated by the mass of spiritualists. The great scandal of spiritualism is undoubtedly the encouragement it gives to the immoral trade of fraudulent mediumship.

SPITZBERGEN. This group of rocky, barren, and snowclad islands, lost in the solitudes of the Arctic Ocean, 400 miles north-northwest of the North Cape of Norway, but nevertheless well known for at least four centuries to European whalers and seal-hunters, has of late acquired new interest from the scientific expeditions by which it has been selected either as a base for attempts to reach the north pole or as a field in which to inaugurate a new era of scientific exploration in the arctic regions. From Spitzbergen Parry started in 1827 on the sledge journey which brought him within 480 miles of the pole; it was the starting-point of the investigations which led Charles Martins to his brilliant generalizations of the flora, present and past, of the earth; and numerous Swedish expeditions from 1858 onward have accumulated an amount of knowledge, so vast and so important, as to be comparable only with the results of the great equatorial and arctic journeys of the first years of the nineteenth century.

The Spitzbergen archipelago, lying between 76° 30′ and 80° 30′ N. latitude and 10° and 30° E. longtitude —half-way between Greenland and Nova Zembla—consists of six large and a great number of smaller islands. The chief, that of West Spitzbergen, shaped like a wedge pointed toward the south, and deeply indented on the west and north by long branching fjords, has an area of nearly 15,200 square miles. High mountains, reaching 4,560 feet in the Horn Sound Tind, cover its southern parts; while a wide plateau, with an altitude of from 1,500 to 2,000 feet and covered by a thick ice-sheet, occupies the north. Several fjords—Horn Sound, Bel Sound, Ice Fjord (fifteen miles wide and eighty long), and the double fjord of King's Bay and Cross Bay on the west, and Liefde, Wiide and Lomme Bays on the north, deeply penetrate the island. One of the ramifications (Dickson Bay) of the beautifnl Ice Fjord, 150 fathoms deep, nearly reaches the head of Wiide Bay, so as almost to divide the island. A long narrow island, Prince Charles' Foreland, with peaks of nearly 5,000 feet high, runs parallel to part of the west coast of West Spitzbergen, from which it is separated by a narrow strait. The broad Stor (Great) Fjord, or Wiide Jans Water, separates the main island from two others to the east—Stans Foreland (2,500 square miles) and Barents Land (580 square miles). Formerly these were considered as one, and named Edge Island, until the narrow Walter Thymen Strait which parts them was discovered. A few peaks estimated at from 1,600 to 2,000 feet high, protrude above the snow and ice by which these two imperfectly explored islands are covered. To the northeast of West Spitzbergen, separated from it by Hinlopen Strait (seven to sixty miles in breadth) lies North-East Land, with an area of about 6,200 square miles. Its western and northern coasts are indented by several bays and fjords; the southern and eastern shores, on account of the masses of ice by which they are constantly girt, remain unexplored. This island appears like a broad plateau covered by an ice sheet 2,000 to 3,000 feet in thickness from which a few peaks protrude. Slowly moving toward the east, this immense sheet of ice discharges into the sea by a huge ice-wall, unbroken by promontories for 150 miles, thus forming the broadest glacier known—Dickson's glacier. Eastward from this group of islands, 100 miles to the northeast of Stans Foreland, rises another island measuring ninety miles from west to east. Marked either Gillis' Land or Wiche's Land in earlier maps, it was seen from Spitzbergen as a snow-clad mass mingling with the fogs of the sea by a Swedish expedition, and later on by Heuglin and Zeil; but it was not until 1872 that the Norwegian whalers Altman, Johnsen, and Nilsen reached it from the east and nearly circumnavigated it. After some discussion about its name, it has received from Professor Mohn the name of King Charles Land, which is now generally accepted. The wide strait which separates it from Spitzbergen is called Olga Strait. It is now established that Gillis saw Gillis' Land to the northeast of the archipelago, and this land which may perhaps be a link between the Spitzbergen archipelago and that of Franz-Josef, has been again sighted by Norwegian seal-hunters. Numerous small islands lie around the larger—the Danes and Norwegian Islands on the northwest, the Seven Islands on the north, Outger Reps, Brock, and Charles XII. Island on the northeast, Waygat Islands and William I. Island in Hinlopen Strait, the Ryk Yse Archipelago, Hope Island, and the Thousand Islands (about a hundred small rocks) to the east and south of Stans Foreland, and many other smaller ones. Many of these small islands rise to a height of 1,500 to 1,700 feet.

Owing to the warm current, the climate of Spitzbergen is less severe than in the corresponding latitudes of Greenland and Smith Sound. The isotherm of 23° Fahr. (−5° C.), which crosses the middle of Eastern Siberia, touches its southern extremity, and only the northeast coasts of West Spitzbergen and North-East Land have an average yearly temperature so low as 14° to 10.5° (−10° to −11.9° C.). At Mussel Bay (79° 53′) the average yearly temperature is 16° (January 14.1°, July 39.3°). Spring comes in June; the snow becomes saturated with water and disappears in places, and scurvy grass and the polar willow open their buds. By the end of June the thermometer has ceased to sink below the freezing-point at night; July, August, and September are the best months. In September, however, autumn sets in on shore, though the whalers continue cruising until the end of the month, and even reach the highest latitudes. By the end of September the pack-ice rapidly freezes into one solid mass.

Glaciers are largely developed. On the high grounds the snow under a level of from 1,200 to 1,500 feet disappears every year; but on the plateaus it continually accumulates, so as to cover them with an immense ice-sheet, like that of Greenland, which slowly discharges by the valleys toward the sea in the form of immense glaciers. All North-East Land and the interior of West Spitzbergen are covered with such ice-sheets, which descend to King's Bay by a glacier fifteen miles wide, or by that already alluded to in North-East Land, where the ice-cliffs are from 200 to 400 feet high. These glaciers, however, discharging into comparatively shallow waters, do not produce such icebergs as those of Greenland.

The flora is of course poor. The only tree is the polar willow, which does not exceed two inches in height and bears a few leaves not larger than a man's finger-nail; and the only bush is the crowberry (*Empetrum nigrum*), to which the recently discovered cloudberry (*Rubus Chamæmorus*) may be added. Flowering plants are represented by as many as ninety-six species, of which eighty-one grow in Greenland and sixty-nine in Scandinavia; forty-three species are alpine cosmopolites, and have been met with on the Himalayas. The ferns are represented by two species.

The fauna, although not very rich in species, is exceedingly rich in individuals. It includes fifteen mammals, only two of which are terrestrial—the reindeer and the ice-fox—besides the usual inhabitant of the arctic regions, the polar bear. The number of reindeer is really puzzling. In a single summer, or rather in the course of a few weeks, no fewer than 1,500 to 2,000 reindeer were killed by hunters for several consecutive years previous to 1868. Much emaciated in June, they grow very fat toward the end of the autumn, after feeding on the mosses. Great numbers are "marked" (that is, have both ears cut at the same height), and the hunters are persuaded that these individuals come from an unknown continent in the northeast, where they have been marked by the hand of man. The Greenland whale has completely disappeared in consequence of the great havoc made during the last two centuries: according to Scoresby, no less than 57,590 individuals were killed between 1669 and 1775. A perfectly reckless extermination of seals is still going on. Numberless walruses tumble about in the water, or lie in crowds on the floating ice; and their number further increases when the flocks of Greenland seals arrive in August.

Birds visit the archipelago in such vast flocks that the cliffs are literally covered with them. The fulmar petrel (*Procellaria glacialis*)—a herald of polar regions—meets the ships approaching Spitzbergen far away from the coasts. Its colonies cover the cliffs, as also do those of the glaucous gull (*Larus glaucus*), or the "burgomaster." Rotches (*Mergulus alba*), black guillemots (*Uria grylla*), ivory gulls (*Larus eburneus*), auks and kittiwake gulls (*Larus tridactylus*) breed extensively on the cliffs, while geese, loons, and snipe swarm on and about the lagoons and small freshwater ponds. The bernacle goose (*Anser bernicla*) is only a bird of passage, as it goes farther northeast to nest. The eider breeds in large colonies on the islands, where its young are safe from the ice-fox, only the glaucous gull and the brent goose (*Bernicla brenta*) being admitted to keep them company, while the lumme (*Mormon arcticus*) and the tern confine themselves to separate cliffs. These birds, however, are only guests in Spitzbergen, the snow-bunting (*Emberiza nivalis*) being the only species which stays permanently; twenty-three species breed regularly on Spitzbergen, and four others (the falcon, snowy owl, swan, and skua) come occasionally.

There are twenty-three species of fishes, but no reptiles. Insects are few. Man does not live on Spitzbergen, and the attempts of the Swedes to winter there have for the most part proved failures, except in the case of the "Sofia" expedition, which succeeded in wintering without great loss, though not without suffering from scurvy. None but the Russian "Pomory" (inhabitants of the Murman coast) have succeeded in enduring the arctic winters. The patriarch of Spitzbergen, the Pomor Staraschin (Starostine), spent no less than thirty-two winters (fifteen being consecutive) on the islands, dying of old age in 1826. There was a time in the seventeenth and eighteenth centuries when thousands of Dutch, Danes, and others were attracted to Spitzbergen by the whale fishing.

Spitzbergen was discovered in 1596 by William Barents, and his companion, Cornelius Rijp, is believed to have circumnavigated the archipelago. Nevertheless it was long considered as a part of Greenland, and described under the names of East Greenland, Newland, King James' Land, until the old name of Spitzbergen gained the ascendancy. But long before Barents discovered it the Russians had known it under the name of Grumant (a word of unknown origin), and when Chancellor arrived at Archangel in 1553 he learned that the Russians visited Grumant for hunting purposes. After the seventeenth and eighteenth century whalers, the Russians began to visit the group, chiefly for walruses, seals, foxes, reindeer, bears, and birds; their huts and crosses are met with at very many places on the coast. Many wintered for several consecutive winters. Since 1830 their visits have almost ceased. The Norwegians began to visit the archipelago about 1795, and their small vessels now visit the Spitzbergen waters in considerable numbers. In 1822 a party wintered successfully, but later attempts have for the most part proved fatal on account of scurvy. To these experienced arctic navigators—assisted by Norwegian *savants*—we are indebted for so many important discoveries in the Barents, Kara, and Siberian Seas.

SPLEEN. See VASCULAR SYSTEM. For diseases of the spleen, see PATHOLOGY; also MALARIA and WOOL-SORTER'S DISEASE.

SPOHR, LUDWIG, violinist and composer, was born at Brunswick on April 25, 1784, but spent his childhood at Seesen, where in 1789 he began to study the violin, and worked so industriously that at six years old he was able to take the leading part in Kalkbrenner's trios. He received his general education at the Brunswick grammar-school—taking lessons on the violin from Kunisch and studying composition under Hartung. The little he learned from the last-named professor was the only theoretical instruction he ever received, for, as he himself tells us, he taught himself to compose by studying the scores of Mozart. After playing a concerto of his own at a school concert with marked success, he was placed for a time under Maucourt, the leader of the duke's band; and so rapid was his progress that in 1798 he was able to start on his first artistic tour. His first violin concerto was printed in 1803. In that year Spohr returned to Brunswick and resumed his place in the duke's band. A visit to Paris was prevented by the loss of his favorite violin—a magnificent Guarnerius, presented to him in Russia. Having played in Berlin, Leipsic, Dresden, and other German towns, his increasing reputation gained for him in 1805 the appointment of leading violinist at the court of the duke of Gotha. Soon after this he married his first wife, Dorette Scheidler, a celebrated harpist. At Gotha he composed his first opera, *Die Prüfung*, but did not succeed in placing it on the stage. *Alruna* was equally unfortunate, though it was rehearsed with approval at Weimar in 1808. Spohr's third opera, *Der Zweikampf mit der Geliebten*, written in 1809, was successfully performed at Hamburg in the following year. In 1811 he produced his (first) *Symphony in E flat*, and in 1812 composed his first oratorio, *Das jüngste Gericht*. It was while employed in the preparation of this work that he first felt the inconvenience inseparable from an imperfect theoretical education; and with characteristic energy, he set about the diligent study of Marpurg's *Abhandlung von der Fuge*.

In 1812 Spohr visited Vienna, where his splendid violin-playing created a profound sensation, and he was induced to accept the appointment of leader of the orchestra at the Theater na der Wien. He then began the preparation of his greatest dramatic composition, *Faust*, which he completed in 1813, though it was not performed until five years later. His strength as a composer was now fully developed; and the fertility of his imagination enabled him to produce one great work after another with astonishing rapidity. He resigned his appointment at Vienna in 1815, and soon afterward made a tour in Italy, where he performed his eighth violin concerto, the *Scena Cantante nello Stilo Drammatico*—the finest of his compositions for his favorite instrument. On Spohr's return to Germany in 1817 he was appointed conductor of the opera at Frankfort; and in that city in 1818 he first produced his dramatic masterpiece, *Faust*. The favor with which this was received led to the composition of *Zemire und Azor*, a romantic piece founded on the story of *Beauty and the Beast*, which, though by no means equal to its predecessor in merit, soon attained a much higher degree of popularity.

Spohr first visited England in 1820, and on March 6th played his *Scena Cantante* with great success at the first Philharmonic concert. At the third he produced a new *Symphony* (No. 2) *in D minor*, written expressly for this occasion, which is remarkable as the first on which the conductor's *bâton* was used at a concert of the Philharmonic Society. Spohr's new symphony met with an enthusiastic reception, as did the earlier one (No. 1, in E flat), which was played, together with his *Nonetto*, at the last concert of the series. After supplementing his visit to England by a short sojourn in Paris, Spohr returned to Germany and settled for a time in Dresden, where German and Italian opera were flourishing side by side under the direction of Weber and Morlacchi. His artistic relations with the composer of *Der Freischütz* were not altogether satisfactory; nevertheless Weber did not hesitate to recommend him strongly to the elector of Hesse Cassel as "kapellmeister." Spohr entered upon his duties at Cassel on January 1, 1822, and soon afterward began the composition of his sixth opera, *Jessonda*, which he produced in 1823.

Spohr's appointment at Cassel gave him the opportunity of bringing out his new works on a grander scale and with more careful attention to detail than he could have hoped to attain in the service of a less generous patron than the elector. And he never failed to use these privileges for the purpose of doing justice to the works of other composers. Soon after his installment in his new office Mendelssohn, then a boy of thirteen, visited Cassel with his father; notwithstanding the disparity of their years, a firm and lasting friendship sprang up between the rising genius and the already famous composer, which ceased only with Mendelssohn's death in 1847; and in other similar cases Spohr always proved himself ready to appreciate and foster the talent displayed by others, though it must be admitted that as a critic he was very difficult to please. The success of *Jessonda* led him to produce, in 1825, a seventh opera—*Der Berggeist*—founded upon the old German legend of Rübezahl, the ruling spirit of the Riesengebirge. Though less popular than its predecessor, this fine work attained a very fair success. But a far greater triumph awaited the composer at the Rhenish musical festival held at Düsseldorf in 1826. On this occasion his oratorio *Die letzten Dinge* met with so enthusiastic a reception that it had to be repeated a few days later for the benefit of a charity. This work, known in England as *The Last Judgment*, is undoubtedly the greatest of Spohr's sacred compositions. In 1827 Spohr produced his eighth opera, *Pietro von Abano*, the plot of which depends for its chief interest upon the resuscitation by the famous necromancer of a lady long since dead and committed to the tomb. The work met with a fair, though not a lasting, success; and the same may be said of a much finer opera, *Der Alchymist*, produced in 1830. Spohr's next publication was of a very different character. His *Violin School*, produced in 1831, is so useful as a code of instruction for advanced students that there is probably no great violinist now living who has not been more or less indebted to it for the perfection of his technique. It holds with regard to the violin a position no less important than that which Cramer's *Studies* has so long held in connection with the pianoforte.

The year 1833 Spohr spent in the preparation of a new oratorio—*Des Heiland's letzte Stunden*, known in England as *Calvary* or *The Crucifixion*—which was performed at Cassel on Good Friday, 1835, and sung in English at the Norwich festival of 1839, under Spohr's own direction, with such unexampled success that he was accustomed to speak of this event as the greatest triumph of his life. For the Norwich festival of 1842 he composed *The Fall of Babylon*, which also was a perfect success. His last opera, *Die Kreuzfahrer*, was produced at Cassel in 1845. Of his nine symphonies the finest, *Die Weihe der Töne*, was produced in 1832. His compositions for the violin include concertos, quartets, duets, and other concerted pieces and solos, adapted for the chamber and the concert room, and among these a high place is taken by four double quartets—a form of composition of which he was both the inventor and the perfecter. He was, indeed, very much inclined to explore new paths, notwithstanding his attachment to classical form, and his freedom from prejudice was proved by the care with which he produced Wagner's *Flying Dutchman* and *Tannhäuser* at Cassel in 1842 and 1853, in spite of the elector's opposition. Spohr retained his appointment until 1857, when, very much against his wish, he was pensioned off. In the same year he broke his arm, but he was able to conduct *Jessonda* at Prague in 1858. This, however, was his last effort. He died at Cassel on October 16, 1859.

SPOKANE FALLS, one of the most important business centers in the eastern portion of Washington, is a handsomely built city, occupying an elevated plateau on the Spokane river, thirty miles from the beautiful Cœur d'Alene lake and in sight of the Cœur d'Alene mountains. The city is also an equally important railway center of the Northern Pacific system, 449 miles from Portland, and 1,512 miles west of St. Paul, and has been elegantly described as the northwestern gateway to an inland empire of endless resources and the grandest possibilities. In addition to all this, it is the center of an area of cultivable lands of unsurpassed richness, and the supply point for the rich mining districts of Cœur d'Alene and Salmon river. The city was laid out and incorporated early in the eighties, and in 1884 its population was about 3,000. Since that period its progress and development have been phenomenal. On August 5, 1889, the entire business portion of the city was destroyed by fire, entailing a loss of $8,000,000, but the space then burned over has since been rebuilt in manner both substantial and artistic, and a very pronounced impetus given to the progress and completion of improvements generally. In addition to the Northern Pacific the city is well provided with railroad accommodations, being the terminus of the Spokane Falls and Northern railroad, of the Spokane and Palouse, Seattle, Lake Shore and Eastern, Central Washington, and of the Pacific division of the Union Pacific. Not less complete and adequate is the admirable distribution of the water power obtained from Spokane river, a power in fact so far beyond what can be utilized that reliance upon any other source of power is unnecessary. The financial system of the city has attained to large proportions, and is now represented by seven national, one state and two savings banks, with a cash capital of $1,100,000, deposits approximating $4,000,000, and an abundant surplus. The improvements completed and in progress during the past year have cost more than $10,000,000, and those proposed for the immediate future will represent a total investment of many additional millions. In the way of schools, churches, hotels, public halls, hospitals, societies, newspapers, mills, and manufacturing industries, the city is well supplied, while the residence portions on the hillsides and along the river front are built up with houses architecturally after the most attractive designs, of the best material, and provided with every improvement. The Holly system of water supply has been adopted, and electricity utilized both for illuminating and street railway purposes, while communication between the north and south divisions of the city is had by ten bridges, seven of which were opened for traffic in 1889. The population, quoted at 3,000 in 1884, is now (1890) 19,922.

SPOLETO (Lat., *Spoletium*), a city of Italy, in Umbria, placed in a commanding position near the Via Flaminia, between Rome and Perugia, is said to have been colonized in 240 B.C. After the battle of Trasimenus (217 B.C.) Spoletium was attacked by Hannibal, who was repulsed by the inhabitants. During the Second Punic War the city was a useful ally to Rome. It suffered greatly during the civil wars of Marius and Sulla. The latter, after his victory over Crassus, confiscated the territory of Spoletium and reduced it to the rank of a military colony. Under the empire it again became a flourishing town. Under the Lombards Spoleto became the capital of an independent duchy (from *c.* 570), and its dukes ruled a considerable part of central Italy. Together with other fiefs, it was bequeathed to Pope Gregory VII. by the empress Matilda, but for some time struggled to maintain its independence. In 1881 it had a population of 7,969 (commune, 21,507), many of whom are occupied in the weaving of woolen stuffs. It is the seat of an archbishopric for the three dioceses of Spoleto, Bevagna, and Trevi.

SPONGES. The great advance which has been made during the past fifteen years in our knowledge of the sponges is due partly to the vivifying influence of the evolutional hypothesis, but still more to the opportunities afforded by novel methods of technique. In the general progress the fossil sponges have been involved, and the application of Nicol's method of studying fossil organisms in thin slices has led, in the hands of Zittel and others, to a complete overthrow of those older classifications which relegated every obscure petrifaction to the fossil sponges and consigned them all to orders no longer existing. But, while many problems have been solved, still more have been suggested. An almost endless diversity in details differentiates the sponges into a vast number of specific forms; the exclusive possession in common of a few simple characteristics closely unites them into a compact group, sharply marked off from the rest of the animal kingdom.

As an example of one of the simplest known sponges we select *Ascetta primordialis*, Haeckel. This is a hollow vase-like sac closed at the lower end, by which it is attached, opening above by a comparatively large aperture, the *osculum* or vent, and at the sides by numerous smaller apertures or *pores*, which perforate the walls. Except for the absence of tentacles and the presence of pores it offers a general resemblance to some simple form of *Hydrozoon*. Histologically, however, it presents considerable differences, since, in addition to an endoderm and an ectoderm, a third or mesodermic layer contributes to the structure of the walls; and the endoderm consists of cells each of which resembles in all essential features those complicated unicellular organisms known as choanoflagellate *Infusoria* (see PROTOZOA). With this positive character is associated a negative one: nematocysts are entirely absent. The activity of the *Ascetta*, as of all sponges, is most obviously manifested, as Grant first observed, by a rapid outflow of water from the oscule and a gentle instreaming through the pores—a movement brought about by the energetic action of the flagella of the endodermic cells. The instreaming currents bear with them into the cavity of the sac (paragastric cavity) both protoplasmic particles (such as *Infusoria*, diatoms, and other small organisms) and dissolved oxygen, which are ingested by the flagellated cells of the endoderm. The presence of one or more contractile vacuoles in these cells suggests that they extricate water, urea, and carbonic acid. The insoluble residue of the introduced food, together with the fluid excreta, is carried out through the oscule by the excurrent water. New individuals are produced from the union of ova and spermatozoa, which develop from wandering amœboid cells in the mesoderm. The walls of *Ascetta* are strengthened by calcareous scleres, more especially designated as spicules, which have the form of triradiate needles. If we make abstraction of these we obtain an ideal sponge, which Haeckel has called *Olynthus* and which may be regarded as the ancestral form from which all other sponges have been derived.

Fission is probably one of the processes by which compound sponges are produced from simple individuals. Artificial fission has been practiced with success in the cultivation of commercial sponges for the market. External gemmation has been observed in *Thenea*, *Tethya*, *Polymastia* and *Oscarella*. A mass of indifferent sponge-cells accumulates at some point beneath the skin, bulges out, drops off, and gives rise to a new individual. Internal gemmation, which results in the formation of a statoblast, is only known to occur in the freshwater *Spongillidæ*. The statoblasts consist of a mass of yolk-bearing mesoderm cells, invested by a capsule, which in *Ephydatia fluviatilis* is composed of an inner cuticle of spongin separated from a similar outer layer by an intermediate zone of amphidisks and interspersed protoplasmic cells. On one side of the capsule is a hilum which leads into the interior.

Our knowledge of this subject is at present but fragmentary; we await fuller information in the future reports on the sponges announced yearly by scientists. The sponges are widely distributed through existing seas, and freshwater forms are found in the rivers and lakes of all continents except Australia, and in numerous islands, including New Zealand. Many genera and several species are cosmopolitan, and so are most orders.

Until about 1876 one of the chief obstacles to the interpretation of fossil sponges arose from a singular mineral replacement which most of them have undergone, leading to the substitution of calcite for the silica of which their skeletons were originally composed.

When the living matter is removed from a Ceratose sponge a network of elastic horny fibers, the skeleton of the animal, remains behind. This is the sponge of commerce. Of such sponges the softest, finest in texture, and most valued is the Turkey or Levant sponge, *Euspongia officinalis*, Lin. The other two varieties are the *Hippospongia equina*, O. Schmidt, and the Zimocca sponge, *Euspongia zimocca*, O.S., which is not so soft as the others. All three species are found at from 2 to 100 fathoms along the whole Mediterranean coast, including its bays, gulfs, and islands, except the western half of its northern shores as far as Venice and the Balearic Isles, Corsica, Sardinia, and Sicily. Bath sponges occur around the shores of the Bahamas, and less abundantly on the north coast of Cuba. They are of several kinds, one not distinguishable from the fine Levant sponge; others, the "yellow" and "hardhead" varieties, resemble the Zimocca sponge; and of horse sponges there appear to be several varieties, such as the "lamb's-wool" and the "velvet" sponge. The fine bath sponge occurs on the shores of Australia (Torres Straits, the west coast, and Port Phillip on the south coast). A sponge eminently adapted for bathing purposes but not yet brought into the market, occurs about the South Caroline Islands, where it is actually in use, and at Port Phillip in Australia. The fine bath sponge occurs in the North Pacific, South Atlantic, and Indian Oceans, so that its distribution is world-wide.

The methods employed to get sponges from the bottom of the sea, where they grow attached to rocks, stones, and other objects, depend on the depths from which they are to be brought. In comparatively shallow water they may be loosened and hooked up by a harpoon; at greater depths, down to 30 or 40 fathoms, they are dived for; and at depths of from 50 to 100 fathoms they are dredged with a net. The method of harpooning was the earliest practiced, and is still carried on in probably its most primitive form by the Dalmatian fishermen. Small boats are used, manned by a single harpooner with a boy to steer; when, however, the expedition is to extend over night the crew is doubled. The harpoon is a five-pronged fork with a long wooden handle, and if this is not long enough another harpoon is lashed on to it.

The Dalmatian fishers throw a smooth stone dipped in oil a yard or so in front of the boat; the stone scatters drops of oil as it flies and so makes a smooth track for the "lookout." The Greeks use a zinc-plate cylinder about one and one-half feet long and one foot wide, closed at the lower end by a plate of glass, which is immersed below the surface of the sea; on looking through this the bottom may be clearly seen even in thirty fathoms. This plan is also adopted in the Bahamas, where harpooning carried on after the Greek system gives employment to over 5,000 men and boys.

The primitive method of diving with no other apparatus than a slab of stone to serve as a sinker and a cord to communicate with the surface is still practiced in the Mediterranean. The diver carries a net around his neck to hold the sponges. On reaching the bottom he hastily snatches up whatever sponge he sees. After staying down as long as he is able—an interval which varies from two to at the most three minutes—he tugs violently at the cord and is rapidly drawn up. On entering the boat from depths of twenty-five fathoms he quickly recovers from the effects of his plunge after a few powerful respirations; but after working at depths of thirty to forty fathoms or more he reaches the surface in a swooning state. The work is severe, and frequently the diver returns empty-handed to the boat. Diving is usually carried on in the summer months; in winter it is too cold, at all events without a diving-dress. The ordinary diver's dress with pumping apparatus is largely used by the Greeks. The diving is carried on from a ship manned by eight or nine men, including one, or rarely two, divers. At a depth of from ten to fifteen fathoms the diver can remain under for an hour, at greater depths up to twenty fathoms only a few minutes; the consequences of a longer stay are palsy of the lower extremeties, stricture, and other complaints. Dredging is chiefly carried on along the west coast of Asia Minor, principally in winter after the autumn storms have torn up the seaweeds covering the bottom. The mouth of the dredge is six yards wide and one yard high; the net is made of camel-hair cords of the thickness of a finger, with meshes four inches square. It is drawn along the bottom by a tow-line attached to the bowsprit of a sailing vessel or hauled in from the shore.

SPONSOR. The presence of some suitable sponsor or sponsors to give the answers required and undertake the vows involved would seem to be almost essential to the right administration of the sacrament of baptism, in the case of infants at least. In this aspect, however, as in many others, the early history of the development of the rite of baptism remains obscure. The Greek word for the person undertaking this function is ἀνάδοχος, to which the Latin *susceptor* is equivalent. The word "sponsor" in this ecclesiastical sense occurs for the first time, but incidentally only, and as if it were already long familiar, in Tertullian's treatise *De Baptismo* (c. 18). For a long time there was no fixed rule as to the necessary or allowable number of sponsors, and sometimes the number actually assumed was large. By the council of Trent, however, it was decreed that one only, or at most two, these not being of the same sex, should be permitted. The rubric of the Church of England, according to which "there shall be for every male child to be baptized two godfathers and one godmother, and for every female one godfather and two godmothers," is not older than 1561; in the *Catechism* the child is taught to say that he received his name from his "godfathers and godmothers." At the Reformation the Lutheran churches retained godfathers and godmothers, but the Reformed churches reverted to what they believed to be the more primitive rule, that in ordinary circumstances this function should be undertaken by a child's proper parents. All churches, it may be added, of course demand of sponsors that they be in full communion. In the Church of Rome priests, monks, and nuns are disqualified from being sponsors, either "because it might involve their entanglement in worldly affairs," or more probably because every relationship of fatherhood or motherhood is felt to be in their case inappropriate.

SPONTINI, Gasparo Luigi Pacifico, dramatic composer, was born at Majolati (Ancona) in Italy, November 14, 1774, and educated at the Conservatorio de' Turchini at Naples under Sala, Tritto, and Salieri. After producing some successful operas at Rome, Florence, Naples, and Palermo, he settled in 1803 at Paris. His reception in the French capital was anything but flattering. His first comic opera, *Julie*, proved a failure; his second, *La Petite Maison*, was hissed. Undaunted by these misfortunes, he abandoned the light and somewhat frivolous style of his earlier works, and in *Milton*, a one-act opera produced in 1804, achieved a real success. His first masterpiece was *La Vestale*, completed in 1805, but kept from the stage through the opposition of a jealous clique until December 15, 1807, when it was produced at the Académie, and at once took rank with the finest works of its class. The composer's second opera, *Ferdinand Cortez*, was received with equal enthusiasm in 1809; but his third, *Olympia*, was much less warmly welcomed in 1819.

Spontini had been appointed in 1810 director of the Italian opera; but his quarrelsome and grasping disposition led to his summary dismissal in 1812, and, though reinstated in 1814, he voluntarily resigned his post soon afterward. He was in fact very ill fitted to act as director; yet on May 28, 1820, five months after the failure of *Olympia*, he settled in Berlin by invitation of Frederick William III., commissioned to superintend all music performed at the Prussian court and compose two new grand operas, or three smaller ones, every three years. *Die Vestalin*, *Ferdinand Cortez*, and *Olympia*—the last two entirely remodeled—were produced with great success in 1821. A new opera, *Nourmahal*, founded on Moore's *Lalla Rookh*, was performed in 1822, and another, entitled *Alcidor*, in 1825; and in 1826 Spontini began the composition of *Agnes Von Hohenstaufen*, a work planned on a grander scale than any of his former efforts. The first act was performed in 1827, and the complete work in three acts graced the marriage of Prince William in 1829. Though the German critics abused it bitterly, *Agnes von Hohenstaufen* is undoubtedly Spontini's greatest work. After the death of Frederick William III. in 1840, Spontini's conduct became so violent and imperious that in 1842 Frederick William IV. dismissed him, with power to retain his titles and live wherever he pleased in the enjoyment of his full salary. He elected to settle once more in Paris, after a short visit to Italy; but beyond conducting occasional performances of some of his own works, he made but few attempts to keep his name before the public. In 1847 he revisited Berlin and was invited by the king to conduct some performances during the winter. In 1848 he became deaf. In 1850 he retired to his birthplace, Majolati, and died there on January 14, 1851.

SPOONBILL. The bird now so called was formerly known in England as the Shovelard or Shovelar, while that which used to bear the name of Spoonbill, often amplified into Spoon-billed Duck, is the SHOVELER (*q.v.*) of modern days. The Spoonbill ranges over the greater part of middle and southern Asia, and breeds abundantly in India, as well as on some of the islands of the Red Sea, and seems to be resident throughout Northern Africa. In Southern Africa its place is taken by an allied species with red legs, *P. cristata* or *tenuirostris*, which also goes to Madagascar. Australia has two other species, *P. regia* or *melanorhynchus* with black bill and feet, and *P. flavipes*, in which those parts are yellow. The very beautiful and wholly different *P. ajaja* is the Roseate Spoonbill of America, and is the only one found on that continent, the tropical or juxta-tropical parts of which it inhabits. The rich pink, deepening in some parts into crimson, of nearly all its plumage, together with the yellowish green of its bare head and its lake-colored legs, sufficiently marks this bird; but all the other species are almost wholly clothed in pure white, though the English has, when adult, a fine buff pectoral band, and the spoon-shaped expanse of its bill is yellow, contrasting with the black of the compressed and basal portion. Its legs are also black. In the breeding season, a pendant tuft of white plumes further ornaments the head of both sexes, but is longest in the male. The young of the year have the primary quills dark-colored.

SPORADES, the islands "scattered" (as the name, from σπείρειν, "to sow," imports) about the Greek Archipelago, are distinguished on the one hand from the Cyclades, which are grouped around Delos, and on the other from the islands attached, as it were, to the mainland of Europe and Asia. The distinction is not in either case a very definite one, and hence both ancient and modern writers differ as to the list of the Sporades. The Doric Sporades—Melus (MELOS) Pholegandrus, Sicinus, THERA, Anaphe, Astypalæa, and Cos—were by some considered a southern cluster of the Cyclades. In modern times the name Sporades is more especially applied to two groups—the Northern Sporades, which lie northeast of Negropont (Eubœa), along with which they constitute a nomarchy of the kingdom of Greece; and the Southern Sporades, lying off the southwest of Asia Minor, and included in the Turkish vilayet of the "Islands of the White Sea." The Northern, which have altogether an area of 180 square miles and a population of 13,394 (1889), comprise Skiatho, Khiliodromi or Ikos, Skopelo, Pelagonisi, Giura, Pipari, and Skiro (SCYROS), with their adjacencies. The Southern are as follows: Icaria, PATMOS, Leros, Calymno, Astypalæa (Stampalia), Cos (Stanko), Nisyros, Tilos or Episcopi, Sime, Khalki, RHODES, CRETE, and a multitude of lesser isles.

SPORTS, THE BOOK OF, or more properly the DECLARATION OF SPORTS, was issued by James I. in 1617 on the recommendation of Thomas Morton, bishop of Chester, for use in Lancashire, where the king on his return from Scotland found a conflict on the subject of Sunday amusements between the Puritans and the gentry, many of whom were Roman Catholics. Permission was given for dancing, archery, leaping, vaulting, and other harmless recreations, and of "having of May games, Whitsun ales, and morris dances, and the setting up of May-poles and other sports therewith used, so as the same may be had in due and convenient time without impediment or neglect of divine service, and that women shall have leave to carry rushes to church for the decorating of it." On the other hand, "bear and bull baiting, interludes, and (at all times in the mean sort of people by law prohibited) bowling" were not to be permitted on Sunday.

SPOTSWOOD, or SPOTISWOOD, JOHN, archbishop of St. Andrews, was the son of John Spotswood, minister of Calder and "superintendent" of Lothian, and was born in 1565. He was educated at Glasgow, and succeeded his father in the parish of Calder when but eighteen years of age. In 1601 he attended Ludowick, duke of Lennox, as his chaplain, in an embassy to the court of France, and returned in the duke's retinue through England. In 1603 he was nominated by the king to the see of Glasgow, but his consecration (in London) did not take place until October, 1610. In 1615 he was translated as successor of Gladstanes to St. Andrews, and thus became primate and metropolitan of Scotland. In this capacity he presided in several assemblies of the Church of Scotland. He continued in high esteem with James VI. and Charles I., who was crowned by him in 1633 at Holyrood. In 1635 Spotswood was advanced to the chancellorship, but the increasing strength of the Convenanters compelled his resignation in 1638. He was deposed and excommunicated by the Glasgow assembly in that year; charges affecting his moral character were brought against him, but no attempt was made to substantiate these. He died in London on December 26, 1639, and was buried in Westminster Abbey.

SPOTTISWOODE, WILLIAM, mathematician and physicist, was born in London January 11, 1825.

William was educated at Laleham, Eton, Harrow, and Balliol College, Oxford. His bent for science showed itself when he was still a schoolboy, and indeed his removal from Eton to Harrow is said to have been occasioned by an accidental explosion which occurred while he was performing an experiment for his own amusement. At Harrow he obtained in 1842 a Lyon scholarship, and at Oxford in 1845 a first-class in mathematics, in 1846 the junior and in 1847 the senior university mathematical scholarship. In 1846 Spottiswoode left Oxford to take his father's place in the publishing business, in which he was engaged until his death. In 1847 he issued five pamphlets entitled *Meditationes Analyticæ.* This was his first publication of original mathematical work; and from this time scarcely a year passed in which he did not give to the world further mathematical researches. In 1856 Spottiswoode traveled in eastern Russia, and in 1860 in Croatia and Hungary; of the former expedition he has left an interesting record entitled *A Tarantasse Journey through Eastern Russia in the Autumn of 1856* (London, 1857). In 1870 he was elected president of the London Mathematical Society. In 1871 he began to turn his attention to experimental physics, his earlier researches bearing upon the polarization of light and his later work upon the electrical discharge in rarefied gases. He wrote a popular treatise upon the former subject for the "Nature" series (1874). In 1878 he was elected president of the British Association, and in the same year president of the Royal Society, of which he had been a fellow since 1853. He died of fever on June 27, 1883, and was buried in Westminster Abbey.

SPRAIN. See SURGERY.

SPRAT, a marine fish (*Clupea sprattus*) named "garvie" in Scotland, one of the smallest species of the genus *Clupea* or herrings, rarely exceeds five inches in length, and occurs in large shoals on the Atlantic coasts of Europe. It is found also in the southern hemisphere on the coasts of Tasmania and New Zealand, where, however, it seems to be less abundant, since its presence at the antipodes has been discovered only recently, and it does not seem to be the object of a regular fishery. Sprats are very often confounded with young herrings, which they much resemble. The sprat is one of the more important English food-fishes on account of the immense numbers which are caught when the shoals approach the coasts.

SPREMBERG, a small town of Prussia, in the province of Brandenburg, is situated about seventy-five miles to the southeast of Berlin, partly on an island in the river Spree and partly on the west bank. It carries on considerable manufactures of woolen cloth, and has greatly advanced in importance and population since the beginning of the nineteenth century. In 1885 its population numbered 11,011.

SPRENGEL, KURT, German botanist and physician, was born on August 3, 1766, at Boldekow in Pomerania. His father, a clergyman, provided him with a thorough education of wide scope; and the boy at an early age distinguished himself as a linguist, not only in Latin and Greek, but also in Arabic. He appeared as an author at the age of fourteen, publishing a small work called *Anleitung zur Botanik für Frauenzimmer* in 1780. In 1784 he commenced in the university of Halle to study theology and medicine, but soon relinquished the former. He graduated in medicine in 1787. In 1789 he was appointed an extraordinary professor of medicine in his *alma mater*, and in 1795 was promoted to an ordinary professorship. He devoted much of his time to medical work and to investigations into the history of medicine; and he published several very valuable works in this department of knowledge, and made himself well known as one of the ablest medical men in Germany. In 1828 the death of a son, professor of surgery at Greifswald, was felt by him very severely. He experienced several apoplectic seizures, and died in one on March 15, 1833.

SPRINGBOK. A species of antelope.

SPRINGFIELD, the capital of Illinois, and county seat of Sangamon county, is situated five miles from Sangamon river, on the main line of the Chicago and Alton railroad 185 miles southwest of Chicago. In addition to its delightful location Springfield is a city of exceptional attractions and historical interest, as also one of the most conspicuous political and social centers of the State. It has acquired a national celebrity as the scene of Abraham Lincoln's earlier professional and political triumphs, as his home and burial place, and the home and burial place of some of the most distinguished of his contemporaries in Illinois. The city is handsomely laid out with wide, well shaded streets, the buildings both public and private are of the best description, architecturally and otherwise, and the latest improvements and appliances adapted to the requirements of the public service are fully employed. In addition to the Chicago and Alton road, the city is served by the Wabash system, the Illinois Central, Ohio and Mississippi, Chicago and Central Illinois, St. Louis and Chicago, and Jacksonville Southeastern railroads, furnishing complete facilities for rapid communication with every section of the United States and Canada, and aiding in the development and building up of the surrounding country for which Springfield is the receiving and distributing point. The most important public improvement in the city is the State capitol, a massive building of Joliet stone, completed in 1886 at a cost of $5,000,000. It is in the form of a Greek cross 385x297 feet in dimensions, with commanding and elaborately finished porticoes occupying the termini of the cross extensions. The interior of the building is finished in Italian marble, hard woods, etc., frescoed in original and classic design and decorated with works of art in marble and bronze, while a central dome 360 feet high surmounts the structure and can be seen for many miles. Besides the State offices, the capitol contains the Supreme Court chambers, State library, museums of geology and agriculture, and a memorial hall in which are deposited the regimental flags borne through the battles of the Civil War by Illinois soldiers. Half or three quarters of a mile from the city is Oak Ridge, one of the most desirably located cemeteries in the State, the natural beauties of which are enhanced by the wealth of artistic production lavished in the decorations and appointments of the grounds. It is also the location of the Lincoln monument, completed in 1874, after a design furnished by Larkin G. Mead. The monument consists of a column of white marble rising 98⅓ feet above the foundations, the latter inclosing a space 119½x72½ feet divided into a catacomb and memorial hall. A bronze statue of Lincoln occupies a space at the front of the monument, and bronze groups the four corners, representing the artillery, cavalry and infantry branches of the service, and the navy. The Lincoln homestead, located at the intersection of two of the principal streets of the city, opposite the Leland Hotel, is owned by the State, and used as a receptacle for memorials of Lincoln, collected since his death. The executive mansion also is attractive. In addition to these the city contains a court-house and government building, the former being situated in the public square, twenty-five churches, many of which are handsome edifices, hospitals and orphan asylums, five national and two State banks with a combined capital of $1,200,000 and a total surplus of $500,000, four daily and nine weekly papers, also one monthly magazine, a full complement of schools and academies, including two female seminaries, several large and well-equipped hotels, an opera-house with a seating capacity of 1,500 and a great number of stores. The manufactures embrace foundry and machine shops; engine and boiler works; planing, paper and woolen mills; cigar, broom, tile, shoddy-goods, trunk and carriage factories, wire works, fence factories, electric light works, etc., etc., in addition to the machine shops of the Wabash railroad. In the vicinity of the city are coal mines which are in constant operation, employing a large force of hands. The capital was removed from Vandalia to Springfield in 1837, and the city was incorporated in 1840, since which date it has been under municipal control, having paid fire and police departments with other auxiliaries incident to similar organizations. Two lines of street railway are maintained, gas and electric lights are in use and other facilities of a valuable character are available. The population of the city was about 4,600 in 1850, 9,800 in 1860, 17,000 in 1870, 20,000 in 1880 and 24,963 in 1890.

SPRINGFIELD, the county seat of Hampden county, and the largest city in western Massachusetts, is situated on the east bank of the Connecticut river at the junction of the Boston and Albany railroad. The present city was first settled in 1636, and experienced many of the vicissitudes of colonial towns, all of which, however, it survived, and in 1852 was incorporated as a city. On the opposite side of the river is West Springfield, connected with Springfield city by four bridges, three of which are iron. The city is one of the leading railway centers in the State, being the junction of the Boston and Albany, New York, New Haven and Hartford, Connecticut River and New York and New England roads, all of which have erected improvements of a substantial and elegant character. The city also enjoys a widespread reputation for beauty of site and picturesque environments, as well as for the architectural finish displayed in the public buildings and private homes which line the broad, well-shaded streets and avenues into which it is divided. In respect to its educational facilities, social advantages, financial, commercial and manufacturing resources, Springfield is not surpassed by any city of equal population in the State. It contains nine national and three savings banks with an aggregate cash capital of $3,750,000; besides one private bank and a safe deposit company. Three daily papers are issued in addition to nine weeklies, one published in the French language, one bi-weekly, one semi-monthly, one quarterly, and five monthly periodicals. The public buildings embrace a court-house of granite, a city hall in the Renaissance style of architecture, the city library (Gothic), containing between 50,000 and 60,000 volumes, and a museum, St. Michael's Cathedral, Christ Episcopal Church, the Unity and Congregational churches and the offices of the Boston and Albany railroad. The public school system has been in operation for many years, and thirty school buildings are required to meet the wants of the service. Both day and evening sessions are held, giving employment to 164 teachers, and affording the means of education to an average daily attendance of 4,621 pupils. The hotels of the city are also well known to travelers as establishments exceptionally well managed. A conspicuous public enterprise is the government armory, arsenal, and machine shop. It is located upon a tract of land twenty acres in extent, half a mile from the city. The arsenal was founded in 1777, and during the civil war turned out an average of more than 900 muskets daily. Constant employment is furnished to nearly 500 men, and the arsenal is stored with the products of their labor. A fine view of the city and country is to be obtained from the arsenal tower. The range of manufacture in the city is very extensive, including commodities of every character and description from a ponderous engine to the smallest patterns of pearl buttons. The city is lighted with gas and electricity, and pure water is obtained from Ludlow, a suburb ten miles distant. The police and fire departments, the public parks, sixteen in number, water-works, city library, care of the poor, sewage system, etc., are under the direct control of the city government, which is vested in the mayor and city council. The city's population was 15,199 in 1860, 26,703 in 1870, 33,340 in 1880, and 44,179 in 1890.

SPRINGFIELD, the most populous and enterprising city of southwest Missouri, is located among the Ozark mountains in the center of the lead and zinc mining territory of the State. It is also the county seat of Greene county. It was settled at an early day, and incorporated as a city in 1830. During the Civil War it was often the scene of active hostilities, and frequently fell into the hands of each of the opposing forces. The battle of Wilson's creek, at which General Lyon received fatal wounds, occurred near Springfield. At the close of the war the development of the mining industry and agricultural resources in the immediate vicinity of Springfield, gave an impetus to the city's growth, and it has since steadily advanced in population and wealth.

It is situated on an elevated plateau 245 miles west-southwest of St. Louis and sixty miles east of Carthage, on the St. Louis and San Francisco railroad at its intersection with the Kansas City, Fort Scott and Memphis road. It is the seat of Drury college, organized in 1873, an institution conducted under the auspices of the Congregationalists, now having a full corps of professors and nearly one hundred students, and of other educational institutions. There are twelve churches, one savings and six State banks, three daily and six weekly papers, seven hotels, an opera-house, half-a-dozen public halls and a large number of stores. The manufactures are diversified and important. They include machinery, engines, boilers, galvanized iron, lumber, cornices, cars, tobacco, flour, spices, patent medicines, cotton and woolen goods etc., the total output from which sums up very largely in values each year. Agriculture, and as stated mining, are also extensively engaged in near the city and annually increasing the volume of business. All modern improvements such as gas, electric lights, etc., have been utilized, and the importance of the city as a commercial and manufacturing center is steadily appreciating. The population, which was 6,525 in 1880, was returned in 1890 at 21,850.

SPRINGFIELD, the capital of Clark county, and a leading manufacturing city of Ohio, is situated near the confluence of Mad river and Lagonda creek, 45 miles west of Columbus, the capital of the State, 80 miles north of Cincinnati and 130 miles south of Lake Erie. The city is in every respect deserving of the extended reputation it enjoys for superiority of site, handsome improvements, enterprise and public spirit, and as the center of an area of country particularly rich in agricultural resources. Six railroads, the Ohio, Indiana and Western, Cincinnati, Sandusky and Cleveland, New York, Pennsylvania and Ohio, Pittsburgh, Cincinnati and St. Louis, Cleveland, Columbus, Cincinnati and Indianapolis, and Ohio Southern, connect the city with the seaboard, the lakes, and the gulf, as also with the immense and growing territories beyond the Missouri river, and south of the Ohio. As an educational center the city is equally conspicuous, being the location of Wittenberg Lutheran College, established in 1845, and having in addition a high school, lyceum, and graded schools. It also contains a court-house, twenty churches, a public library, one savings and five national banks, three daily and six weekly papers, besides two semi-monthly and two monthly periodicals. A number of excellently managed hotels, and two opera houses, with other places of amusement, are included among the city's appointments. Water power and steam are both employed as the motive power in the conduct of manufacturing industries, which latter embrace reapers, mowers, agricultural implements of a less bulky description, also engines and boilers, steam valves, feed heaters, pumps, furnaces, castings, iron fences, turbine water wheels, hardware specialties, brass metal goods, cabinet ware, brackets, wind-mills, lawn mowers, stationers' supplies, etc., together with planing and grist mills, gas and electric works. The city is lighted both by gas and electricity, and street cars are in operation between various points. In 1860 the population was 7,000, in 1870, 12,652, in 1880, 20,730, and in 1890, 31,895.

SPRINGS. See GEOLOGY, Vol. v., page 2683, and MINERAL WATERS, Vol. vii., page 4230.

SPRUCE. See FIR.

SPURZHEIM, KASPAR, phrenologist, was born near Treves, France, on December 31, 1776, and died at Boston, Mass., on November 10, 1832. (See PHRENOLOGY.) Spurzheim was at first a pupil of Gall, and acted in harmony with him for some years, but they separated in 1813, and Spurzheim afterward declared that Gall had not introduced any improvements in the study of phrenology. "My phrenological views," he said, "differ widely from those of Gall." Spurzheim wrote extensively on phrenology.

SQUARING (or QUADRATURE) OF THE CIRCLE is the problem of finding a square equal in area to a given circle. Like all problems, it may be increased in difficulty by the imposition of restrictions; consequently under the designation there may be embraced quite a variety of geometrical problems. It has to be noted, however, that, when the "squaring" of the circle is especially spoken of, it is almost always tacitly assumed that the restrictions are those of the Euclidean geometry.

Since the area of a circle equals that of the rectilineal triangle whose base has the same length as the circumference and whose altitude equals the radius (Archimedes, *Κύκλου μέτρησις*, prop. 1), it follows that if a straight line could be drawn equal in length to the circumference, the required square could be found by an ordinary Euclidean construction; also, it is evident that, conversely, if a square equal in area to the circle could be obtained, it would be possible to draw a straight line equal to the circumference. Rectification and quadrature of the circle have thus been, since the time of Archimedes at least, practically identical problems. Again, since the circumferences of circles are proportional to their diameters—a proposition assumed to be true from the dawn almost of practical geometry—the rectification of the circle is seen to be transformable into finding the ratio of the circumference to the diameter. This correlative numerical problem and the two purely geometrical problems are inseparably connected historically.

Probably the earliest value for the ratio was 3. It was so among the Jews (1 Kings vii. 23, 26), the Babylonians (Oppert, *Journ. Asiatique*, August, 1872, October, 1874), the Chinese (Biot, *Journ. Asiatique*, June, 1841), and probably also the Greeks. Among the ancient Egyptians, as would appear from a calculation in the Rhind papyrus, the number $(\frac{4}{3})^4$, *i.e.*, 3.16..., was at one time in use. The first attempts to solve the purely geometrical problem appear to have been made by the Greeks (Anaxagoras, etc.), one of whom, Hippocrates, doubtless raised hopes of a solution by his quadrature of the so-called *meniscoi*.

A much less wise class than the π-computers of the nineteenth century are the pseudo-circle-squarers, or circle-squarers technically so called, that is to say, persons who, having obtained by illegitimate means a Euclidean construction for the quadrature or a finitely expressible value for π, insist on using faulty reasoning and defective mathematics to establish their assertions. Such persons have flourished at all times in the history of mathematics; but the interest attaching to them is more psychological than mathematical.

Hermite did not succeed in his attempt on π; but in 1882 Lindemann, following exactly in Hermite's steps, accomplished the desired result. Mathematicians are agreed that the full demonstration leaves something to be desired in the matter of simplicity, and attempts at simplification have already been made by Markoff and Rouché.

SQUASH (*Cucurbita Melopepo*). See GOURD.

SQUILL, the name under which the bulbous root of *Urginea maritima*, Baker, is used in medicine. The plant was formerly placed in the genus *Scilla*, from which it has been separated because the seeds are flat and discoid instead of triquetrous, as in the latter genus. The name of "squill" is also applied by gardeners to the various species of *Scilla*. The medicinal squill is a native of the countries bordering the Mediterranean, and grows from the sea-level up to an elevation of 3,000 feet.

SQUINTING, otherwise known as Strabismus, is a very common and very unpleasant divergence of the optic nerve. In strabismus the two eyes are not directed to the same point. The deviation may be inward or outward, downward or upward, the two first forms being much the most common. Squinting is a nerve disease and varies in amount from slight weakness to complete paralysis of the muscle. It is usually the outgrowth or development of some affection of the sixth nerve or of its nerve-centre, and is attributed either to inherited syphilis or to nervous exhaustion. As a remedy in cases where there is a syphilitic disposition mercury has been advised and iodide of potassium is often used. Spectacles are recommended, but only those selected by a practiced oculist should be used. Surgical operations, sometimes dangerous, and not always efficacious, are commonly prescribed.

SQUIRREL. (See MARMOT). Of the *Sciurina* six genera are commonly recognized, the first being the typical one, *Sciurus*, in which the common English squirrel is included. The characters of the genus are—form slender and agile; tail long and bushy; ears generally well developed, pointed, often tufted; feet adapted for climbing, the anterior pair with four toes and a rudimentary thumb, and the posterior pair with five toes, all the toes having long, curved, and sharp-pointed claws; mammæ from four to six in number; skull lightly built, very similar in shape throughout the genus; post-orbital processes long and curved; incisors narrow and compressed; premolars either one or two above and one below; when two are present above, the anterior one is quite minute and very different from the corresponding tooth in the marmots; molars three on each side above and below.

True squirrels are found throughout the greater part of the tropical and temperate regions of both hemispheres, although they are absent both from Madagascar and the Australian region. The species are both largest and most numerous in the tropics, and reach their greatest development in the Malay parts of the Oriental region.

Squirrels vary in size from animals no larger than a mouse, such as *Sciurus soricinus* of Borneo, or *S. minutus* of West Africa, to others as large as a cat, such as the black and yellow *S. bicolor* of Malaysia, The very large squirrels, as might be expected from their heavier build, are somewhat less strictly arboreal in their habits than the smaller ones, of which the common English species may be looked upon as typical. The Common Squirrel, *S. vulgaris*, whose general habits are two well known to need special description, ranges over the whole of the Palearctic region, from Ireland to Japan, from Lapland to North Italy; but specimens from different parts of this wide range differ so much in color as to have been often looked upon as different species. The pairing time of the squirrel is from February to April, and after a period of gestation of about thirty days it brings forth from three to nine young. In addition to all sorts of vegetables and fruits the squirrel is exceedingly fond of animal food, greedily devouring mice, small birds, and eggs.

Although the English squirrel is a most beautiful little animal, it is far surpassed by many of the tropical members of the group, and especially by those of the Malayan region, where nearly all the numerous species are brilliantly marked, and many are ornamented with variously colored longitudinal stripes along their bodies. One of the commonest and best known of the striped species is the little Indian Palm Squirrel (*S. palmarum*), which in large numbers runs about every Indian village. Another Oriental species (*S. caniceps*) presents almost the only known instance among mammals of the temporary assumption during the breeding season of a distinctly ornamental coat, corresponding to the breeding plumage of birds.

The number of species in the genus *Sciurus* is about seventy-five, of which three belong to the Palearctic, fifteen to the Ethiopian, about forty to the Oriental, and sixteen to the combined Nearctic and Neotropical regions.

Genus Rheithrosciurus.—A single very striking species of squirrel, confined to Borneo, and as yet only known from three or four examples, has been separated generically under the above name. The general shape of its skull is very different from that of other squirrels; but its most peculiar characteristic is the presence of from seven to ten minute parallel vertical grooves running down the front face of its incisors, both above and below, no other squirrel having really grooved incisors at all, and no other member of the whole order of rodents incisor grooves resembling these. Its premolars only number $\frac{1}{1}$, and its molars are simpler and less rigid than in the other genera. This squirrel (*Rh. macrotis*) is a magnificent animal, far larger than the English species, with an enormously long bushy tail, long tufted ears, and black and white bands down its sides.

Genus Xerus.—Fur coarse and spiny. Claws long and comparatively straight. Ear-conches minute or entirely absent. Skull with the post-orbital processes short and directed backward, the bony palate prolonged considerably behind the tooth-row, and the external ridge on the front face of the anterior zygoma-root more developed, and continued much further upward than in *Sciurus*. Premolars $\frac{2}{1}$; molars as in *Sciurus*. This genus contains four well-marked species, known as Spiny Squirrels, all natives of Africa. *X. getulus*, a striped species of North Africa, has much the size and appearance of the Indian palm squirrel; the others are all a little larger than the English squirrel.

Genus Tamias.—The members of this genus are characterized by the possession of internal cheek-pouches, and by their style of coloration, all being ornamented on the back with alternate bands of light and dark color. Their skulls are slender and lighter than those of the true squirrels, from which they differ in several unimportant details. There is only one functional premolar—the small anterior one usually found in *Sciurus* being either absent altogether or quite small and functionless. There are four species, all found in North America, one extending also through Siberia into Eastern Europe. They are known in America as "Chipmunks," and are among the commonest and best known of the indigenous rodents.

Genera Pteromys and Sciuropterus.—The Flying Squirrels, although they cannot fly in the true sense of the word, can yet float through the air for considerable distances by the aid of an extension of skin connecting their fore and hind limbs, and forming a sort of parachute. The flying squirrels are divided into two genera, of which *Pteromys* contains the larger and *Sciuropterus* the smaller species. The two differ in certain details of dentition, and in the greater development in the former of the expanded membranes, especially of the "interfemoral" or posterior membrane, which is in the latter almost wholly absent. In appearance flying squirrels resemble the non-flying forms, although they are even more beautifully colored than the latter. Their habits, food, etc., are also very similar to those of the true squirrels, except that they are more decidedly nocturnal, and are therefore less often seen by the ordinary observer. Of each of the two genera there are about thirteen or fourteen species, all natives of the Oriental region, except that one of *Sciuropterus* is found in North America, and another in Siberia and Eastern Europe—the latter, the *Sciurus volans* of Linnæus' *Systema Naturæ*, being the first flying squirrel that was known to European naturalists.

SRINAGAR. See KASHMIR.

SRÍRANGAM, or SERINGHAM, a town of India, in Trichinopoli district, Madras presidency, situated in 10° 51′ 50″ N. latitude and 78° 43′ 55″ E. longitude, two miles north of Trichinopoli city and almost in the center of the island of Srírangam. The island is formed by the bifurcation of the river Káveri (Cauvery) and by the channel of the Colerun. From 1751 to 1755 the island and its pagodas were the object of frequent contests between the French and the British. Srírangam was constituted a municipality in 1871, and since then much has been done to improve the place. In 1881 the population was 19,773 (9,330 males and 10,443 females).

SRIRANGAPATAM. See SERINGAPATAM.

STAAL, MARGUERITE JEANNE CORDIER DELAUNAY, BARONNE DE, often called in history and literature Madame de Staal-Delaunay, to distinguish her more completely from Madame de Stael-Holstein—was born at Paris on May 30, 1684. Her father was a painter named Cordier. She was well educated, and entered the household of the Duchesse du Maine at Sceaux, at first in no higher capacity than that of *femme de chambre*. Her literary talent soon manifested itself in the literary court of the duchess, who is said, but chiefly on the waiting lady's own authority, to have been not a little jealous of her attendant. Later she had to endure a visit to the Bastille, where she remained for two years. She returned on her liberation to the service of the duchess, refused, it is said, Dacier, the widower of a wife more famous than himself, and in 1735, being then more than fifty, married the Baron de Staal. She died on June 16, 1750.

STADE, a small commercial town in the province of Hanover, Prussia, is situated on the navigable Schwinge, three and one-half miles above its confluence with the Elbe, and twenty miles to the northwest of Hamburg. It carries on a number of small manufactures, and has some shipping trade, chiefly with Hamburg. There are several brickfields in the neighborhood, and deposits of gypsum and salt. Population in 1885, 10,003.

STAEL, MADAME DE (by her proper name and title ANNE LOUISE GERMAINE NECKER, BARONESS OF STAEL-HOLSTEIN), was born at Paris on April 22, 1766, and died there on July 14, 1817. Her father was the famous financier Necker, her mother Suzanne Curchod, who is almost equally famous as the early love of Gibbon, as the wife of Necker, as the mistress of one of the most popular salons of Paris, and as the mother of Madame de Stael. She was a child of unusual intellectual power, and began very early to write though not to publish. She is said to have written her father a letter on his famous *Compte-Rendu*, and there is no doubt that her father's dismissal from the ministry, which followed the presentation of the *Compte*, and the consequent removal of the family from the busy life of Paris, were beneficial to her. During part of the next few years they resided at Coppet, her father's estate on the Lake of Geneva, which she herself made famous. They returned to Paris, or at least to its neighborhood, in 1785, and Mademoiselle Necker resumed literary work of a miscellaneous kind, including two plays, *Sophie* and *Jane Grey*, which were printed sooner or later. It became, however, a question of marrying her. There is a legend that William Pitt the younger thought of her; the somewhat notorious lover of Mademoiselle de Lespinasse, Guibert, a cold-hearted coxcomb of some talent, certainly paid her addresses. But she finally married Eric Magnus, Baron of Stael-Holstein, who was first an attaché of the Swedish legation, and then minister.

The marriage took place on January 14, 1786. The husband was thirty-seven, the wife twenty. Madame de Stael was not a *persona grata* at court, but she seems to have played the part of ambassadress, as she played most parts, in a rather noisy and exaggerated manner, but not ill. Then in 1788 she appeared as an author under her own name (*Sophie* had been already published, but anonymously) with some *Lettres sur J. J. Rousseau*, a fervid panegyric showing a good deal of talent but no power of criticism. She also published several small works, the chief being an essay *De l'Influence des Passions* (1796), and another *De la Littérature Considérée dans ses Rapports avec les Institutions Sociales* (1800). It was during these years that Madame de Stael was of chief political importance. In 1797 she separated formally from her husband. In 1799 he was recalled by the king of Sweden, and in 1802 he died duly attended by her. The exact date of the beginning of what Madame de Stael's admirers call her duel with Napoleon is not easy to determine. Judging from the title of her book *Dix Années d'Exil*, it should be put at 1804.

In 1802 she published the first of her really noteworthy books, the novel of *Delphine*, in which the "femme incomprise" was in a manner introduced to French literature, and in which she herself and not a few of her intimates appeared in transparent disguise. In 1807 *Corinne*, the first esthetic romance not written in German, appeared. The publication was taken as a reminder of her existence, and the police of the empire sent her to Coppet. She stayed there as usual for the summer, and then set out once more for Germany, visiting Mainz, Frankfort, Berlin, and Vienna. She was again at Coppet in the summer of 1808, and set to work at her book *De l'Allemagne*. It took her nearly the whole of the next two years, during which she did not travel much or far from her own house. She had bought property in America and thought of moving thither, but chance or fatality made her determined to publish *De l'Allemagne* in Paris. The submission to censorship which this entailed was sufficiently inconsistent, and she wrote to the emperor one of the unfortunate letters, at once undignified and provoking, of which she had the secret.

The reply to her letter was the condemnation of the whole edition of her book (ten thousand copies) as "not French," and her own exile, not as before to a certain distance from Paris, but from France altogether. She retired once more to Coppet, where she was at first left undisturbed, but by degrees the chateau itself became taboo, and her visitors found themselves punished heavily. Mathieu de Montmorency and Madame Récamier were exiled for the crime of seeing her; and she at last began to think of doing what she ought to have done years before and withdrawing herself entirely from Napoleon's sphere. In the complete subjection of the Continent which preceded the Russian War this was not so easy as it would have been earlier, and she remained at home during the winter of 1811, writing and planning. On May 23d, she left Coppet almost secretly, and journeyed by Berne, Innsbruck, and Salzburg to Vienna. There she obtained an Austrian passport to the frontier, and after some fears and trouble, receiving a Russian passport in Galicia, she at last escaped from the dungeon of Napoleonic Europe, swearing never to return thither. She journeyed slowly through Russia and Finland to Sweden, making some stay at St. Petersburg, spent the winter at Stockholm, and then set out for England. Here she received a brilliant reception and was much lionized during the season of 1813. She published *De l'Allemagne* (a book much more really remarkable than *Corinne*), undertook her *Considérations sur la Révolution Française*, and when Louis XVIII. had been restored returned to Paris. Both in the summer and in the winter of 1814 she visited Coppet, and was meanwhile a prominent figure in Parisian society. She was in Paris when the news of Napoleon's landing arrived and at once fled to Coppet. In October after Waterloo she set out for Italy, not only for the advantage of her own health but that of her second husband, Rocca, who was dying of consumption. Her daughter married Duke Victor de Broglie on February 20, 1816, at Pisa, and became the wife and mother of French statesmen of distinction. The whole family returned to Coppet in June, and Byron now frequently visited Madame de Stael there. Despite her increasing ill-health she returned to Paris for the winter of 1816–17, and her salon was much frequented. But in March she is spoken of as "dying," and she had already become confined to her room, if not to her bed. She died July 14th, and Rocca survived her little more than six months. Nor was her eldest son long-lived. After editing a collected edition of his mother's works he died at the age of thirty-seven in 1827.

Madame de Stael occupies a singular position in French literature. The men of her own time exalted her to the skies, and the most extravagant estimates of her (as "the greatest woman in literary history," as the "foundress of the romantic movement," as representing "ideas," while her contemporary Chateaubriand only represented words, colors and images, and so forth) are to be found in those histories of literature which faithfully repeat second-hand and traditional opinions. On the other hand, it is acknowledged that she is now very little read. Sainte-Beuve, who pro fesses a "culte" for her, and who has treated her at great length and with much indulgence; M. Scherer, a compatriot and co-religionist, who is strongly prejudiced in her favor; Doudan, a kind of literary retainer of her connections—all allow this, and any one who speaks with an intimate knowledge of current French literature must agree that since they spoke neglect of her has increased. An ugly coquette, an old woman who made a ridiculous marriage, a blue-stocking who spent much of her time in pestering men of genius, and drawing from them sarcastic comment behind her back—these things are not attractive. Her books are seen to be in large part merely clever reflections of other people's views, or views current at the time, and the famous "ideas" turn out to be chiefly the ideas of the books or the men with whom she was from time to time in contact. Madame de Stael's faults are great; her style is of an age, not for all time; her ideas are mostly second-hand and frequently superficial. But nothing save a very great talent could have shown itself so receptive. Take away her assiduous frequentation of society, from the later *philosophe* coteries to the age of Byron—take away the influence of Constant and Schlegel and her other literary friends—and probably little of her will remain.

STAFFORD, an inland county of England, is bounded on the southeast by Warwickshire, south by Worcestershire, west by Shropshire, northwest by Cheshire, and east by Derbyshire, just touching Leicestershire. It is of irregular outline, and has been likened to an elongated and compressed pear, somewhat tapering at both ends. Its greatest length from north to south is 53 miles, and its greatest breadth is 35 miles. The area is 748,433 acres—about 1,170 square miles.

Although the general aspect of the county is that of a plain, it has been pronounced "rather a subalpine or hilly district;" but its highest hill, Axe Edge, is only 1,756 feet above the level of the sea. In the north the land is undulating and very picturesque; the hills here are the loftiest in the county, as Axe Edge, Cloud Thorpe, Mow Cop, and other hillocks and mounds called "edges." These are mostly composed of mill-stone grit. The principal rivers are the Trent, the Tame, the Sow, the Penk, the Stour, the Blythe, the Tern, the Churnet, the Lyme, the Smestow, and the Manyfold; of these the Trent is the most important. The Severn has a short part of its course within the county, traversing the coal-field at Arley. The Dove separates Staffordshire from Derbyshire. Several of the rivers are well supplied with fish.

The county is very rich in mineral productions. In a single year 12,000,000 tons of coal and 1,173,866 tons of iron have been obtained. The greatest quantity of iron is raised in the north and of coal in the south. Of the places at which the various products are found may be named—Birch Hills for anthracite coal; Hanley Green for Peacock coal; Longton for cannel coal; Wednesbury for hematite iron ore; Langley Close for gray marble; the Rowley Hills for basalt. At Bilston casting sand, at Kingswinford fire-clay and fire bricks, at Tutbury alabaster, at Powke Hill black marble, and at Hemley Green red ocher are produced. In December, 1885, an important discovery of coal was made near Dudley.

As regards climate the county shares the characteristics common to the midland district of England. Agriculture, though not its distinctive feature, forms a very important item in the industry and wealth of Staffordshire. The returns for 1889 furnish the following report: in corn crops there were 94,273 acres; roots, artificial grasses, etc., 43,343; clover and grasses, 46,832; permanent pasture, 412,566; fallow, 7,203; orchards, 1,188; market gardens, 866; nursery grounds, 233; woods and plantations, 34,911. From the same returns we learn that the number of horses employed in agriculture was 16,031; unbroken horses and brood mares, 7,802; cows in milk or in calf, 74,868; cattle under two years old, 56,224; two years and upward, 25,922; one-year-old sheep, 142,955; sheep under one year, 106,950; and pigs, 48,569. The total number of proprietors in the country was returned in 1873 as 43,371, possessing 638,084 acres, producing an annual rental of $18,151,270. The estimated extent of waste or common land was 7,809. Of the owners 33,672 owned less than one acre each. Eight proprietors were owners of more than 10,000 acres each. The manufactures of Staffordshire are of a very varied character. Almost everything which is made of iron is manufactured in one town or another; and it would only be tedious to enumerate the almost infinite variety of goods produced. Wolverhampton and Willenhall are famous for locks, Cradley for nails, Oldbury for railway carriages, Walsall for spurs, bits and saddlery; Tipton for anchors, Smethwick for glass, Soho for steam engines and hydraulic jacks, Wednesfield for keys, Bilston for tinplate wares, and Bloxwich for bits. Thanks to the labors of Josiah Wedgwood and Flaxman, the pottery work of Staffordshire ranks among the most famous manufactures of the kingdom, and Etruria is a household word wherever the admirable and artistic Wedgwood ware is known. The ale produced at Burton-on-Trent finds a market in almost every civilized country in the world, and in some that can scarcely be so described. The country is admirably provided with railways, canals, and tramways. The main roads are excellent, and are well maintained and kept in capital condition. The population in 1861 was 746,943; in 1871, 858,326; and in 1881, 981,013 (males 492,009, females 489,004), an average of 1.31 persons to an acre. Staffordshire is in the Oxford circuit, and is nearly all in the diocese of Litchfield. The seat of the bishopric and the will courts are at Litchfield. The assize town is Stafford. The county has one court of quarter sessions, and is divided into twenty-two petty and special sessional divisions; and there are 247 civil parishes, and sixteen poor law unions. The municipal boroughs number twelve. By the Redistribution of Seats Act, 1885, the parliamentary representation of Staffordshire was arranged as follows:—seven boroughs each returning one member, one borough returning three, and seven county divisions with one member to each, making seventeen members for the whole county. The county divisions are named respectively Burton, Handsworth, Kingswinford, Leek, Litchfield, North-West, and West. The following is a list of the boroughs, with populations given by or based on the census of 1881:—Wolverhampton (three members), 164,332; Hanley, 75,912; Newcastle-under-Lyme, 49,293; Stafford, 19,977; Stoke-on-Trent, 64,091, Walsall, 59,402; Wednesbury, 68,142; West Bromwich, 56,295.

STAFFORD, a parliamentary and municipal borough of England, and the county town of Staffordshire, is situated on the left bank of the river Sow, almost in the heart of England. It is 123 miles from London and 29¼ from Birmingham, and is in the southern division of the hundred of Pirehill. The principal trades of the town are tanning and the manufacture of boots and shoes, more especially for ladies. The William Salt library contains a unique collection of books, deeds, autographs, engravings, and drawings relating to the county, collected by Mr. Salt and presented by his widow. It contains some 7,000 volumes, between 2,000 and 3,000 deeds, and more than 9,000 drawings, autographs, and valuable MSS., mostly relating to the history, topography, etc., of the county. The town also possesses a good museum, and contains a good school of art and a mechanics' institute. Stafford is well supplied with charitable institutions, among which may be mentioned the general infirmary, built in 1766; the county lunatic asylum in 1818; and the Coton Hill institution for the insane in 1854, beautifully situated on rising ground, which commands extensive views of some of the loveliest country in the county, while its own grounds are tastefully laid out. The parliamentary borough (area 774 acres, with population of 18,904 in 1881) was extended in 1885, and is now identical with the municipal borough. The area of this is 1,012 acres, and the population, 14,437 in 1871, was in 1881 19,977. The Act of 1885 reduced the parliamentary representation from two members to one.

STAG. The English red deer.

STAHL, GEORG ERNST, chemist, was born October 21, 1660, at Ansbach, studied at Jena, and became court-physician to the duke of Weimar in 1687. In 1694 he was appointed professor of medicine in Halle and in 1716 physician to the king of Prussia. He died at Berlin on May 14, 1734. His *Theoria Medica Vera* appeared at Halle in 1707 (see MEDICINE), and his *Experimenta et Observationes Chemicæ* at Berlin in 1731 (see CHEMISTRY).

STAIR, JAMES DALRYMPLE, FIRST VISCOUNT, was born in May, 1619, at Drummurchie in Ayrshire. From the grammar school at Mauchline he went in 1633 to the university of Glasgow, where he graduated in arts on July 26, 1637. What part he took in the war of the Covenant is not certainly known, but he was in command of a troop when recalled in 1641 to compete for a regency (as a tutorship or professorship was then called) in the university of Glasgow. He was elected in March. After nearly seven years' service he resigned his regency, and removed to Edinburgh, where he was admitted to the bar on February 17, 1648.

During the Commonwealth Stair continued to practice at the bar; but like most of his brethren he refused in 1654 to take the oath of allegiance to the Commonwealth and abjuration of royalty. Three years later, on the death of Lord Balcomie, Stair was appointed one of the commissioners for the administration of justice in Scotland on the recommendation of Monk. His appointment to the bench July 1, 1657 by Monk was confirmed by Cromwell on the 26th.

In 1662 he was one of the judges who refused to take the declaration that the National Covenant and the Solemn League and Covenant were unlawful oaths, and, forestalling the deposition which had been threatened as the penalty of continued non-compliance, he placed his resignation in the king's hands. In 1670 Stair served as one of the Scottish commissioners who went to London to treat of the Union. In January, 1671, Stair was appointed president of the Court of Session. In the following year, and again in 1673, he was returned to parliament for Wigtownshire, and took part in the important legislation of those years in the department of private law.

The parliament of 1681, in which Stair again sat, was memorable for two statutes, one in private and the other in public law. The former, relating to the testing of deeds, was drawn by Stair, and is sometimes called by his name. The other was the infamous Test Act, probably the worst of many measures devised at this period with the object of fettering the conscience by oaths. Stair also had a minor share in the form which this law finally took, but it was confined to the insertion of a definition of "the Protestant religion;" by this he hoped to make the test harmless, but his expectation was disappointed, and the form in which it emerged from parliament was such that no honest man could take it. Argyll, who declared he took it only in so far as it was consistent with itself and the Protestant religion, was tried and condemned for treason, and narrowly saved his life by escaping from Edinburgh Castle the day before that fixed for his execution. Stair, dreading a similar fate, went to London to seek a personal interview with the king; but the duke of York intercepted his access to the royal ear, and when he returned to Scotland he found a new commission of judges issued, from which his name was omitted. He retired to his wife's estate in Galloway, and occupied himself with preparing for the press his great work, *The Institutions of the Law of Scotland*, which he published in the autumn of 1681, with a dedication to the king.

He repaired to Holland in October, 1684, took up his residence, along with his wife, some of his younger children, and his grandchild, afterward the field marshal Stair, at Leyden. While there he published the *Decisions of the Court of Session between 1666 and 1671*, of which he had kept a daily record, and a small treatise on natural philosophy, entitled *Physiologia Nova Experimentalis*. In his absence a prosecution for treason was raised against him and others of the exiles by Sir G. Mackenzie, the lord advocate. He was charged with accession to the rebellion of 1679, the Ryehouse plot, and the expedition of Argyll. The proceedings against him were never brought to an issue, having been continued by successive adjournments until 1687, when they were dropped. Stair remained in Holland till the following year, when he returned under happier auspices in the suite of William of Orange. William, who had made his acquaintance through the pensionary Fagel, was ever afterward the firm friend of Stair, and, on the murder of President Lockhart in the following year, Stair was again placed at the head of the Court of Session. Shortly after he was created Viscount Stair. He had now reached the summit of his prosperity, and the few years which remained of his old age were saddened by private and public cares. On November 29, 1695, Stair, who had been for some time in failing health, died in Edinburgh, and was buried in the church of St. Giles.

It is as a legal writer and a judge that he holds a preeminent place among many distinguished countrymen belonging to his profession. The full title of his great work, which runs as follows—*The Institutions of the Law of Scotland, deduced from its Originals, and Collated with the Civil, Canon, and Feudal Laws and with the Customs of Neighboring Nations*—is fully borne out by the contents, and affords evidence of the advantage Stair had enjoyed from his philosophical training, his foreign travels, and his intercourse with Continental jurists as well as English lawyers.

STALYBRIDGE, a municipal and parliamentary borough of England, partly in Lancashire, but principally in Cheshire, is situated on the Tame, one mile east of Ashton-under-Lyne, and seven and one-half east of Manchester. The Tame is crossed by bridges connecting the counties of Chester and Lancaster. The town is one of the oldest seats of the cotton manufacture, the first cotton mill having been erected in 1776 and the first steam engine in 1795. In addition to extensive cotton mills, it possesses woolen factories, iron and brass foundries, machine works, nail works, and paper mills. Stalybridge was created a market-town in 1828, was incorporated as a municipal borough in 1857, and obtained the privilege of returning a member to parliament in 1867. The municipal borough (area 806 acres) had a population of 21,092 in 1871, and 22, 785 in 1881; its limits were extended in 1881 to 3,120 acres, with a population of 25,977.

STAMFORD, a municipal borough and market-town, chiefly in Lincolnshire but partly in Northamptonshire, is situated on the river Welland, and on branches of the Midland, the London and Northwestern, and the Great Northern railway lines, eighty-nine miles north of London and fifty-five south of Lincoln. The prosperity of the town depends chiefly on its connection with agriculture. It possesses iron foundries, agricultural implement works, wagon factories, and breweries. There is also some trade in coal, timber, stones, and slates. The population of the municipal borough (area 1,766 acres) in 1871 was 7,846 and in 1881 it was 8,773; that of the parliamentary borough (area 1,894 acres) in the same years was 8,086 and 8,993. The latter was merged in the counties in 1885, giving its name to a parliamentary division of Lincolnshire.

STAMFORD, one of the more important cities of southern Connecticut, is beautifully situated on Long Island Sound, nearly half way distant between New York and Bridgeport, with both of which cities it is connected by the New York, New Haven and Hartford railroad. The city is also in daily communication with New York by sound steamers. Stamford is a favorite summer resort for southern and western tourists, does an extensive trade along the coast and is largely engaged in manufacturing special lines of standard articles. The principal public building, the town hall, is a massive structure of brick, costing, when ready for occupation, upward of $125,000. The city also contains twelve churches, a high school, one savings and three national banks, four weekly papers, the Stamford Military Institute and a number of elegant residences, stores, public halls, hotels, etc. Among the manufacturing plants is the Yale & Towne Lock Works, the lumber works of St. John Hoyt & Co., the Lincrusta Walton Works and other industries less conspicuous. The city is equipped with water works, gas and electric lights, street railways, and other accommodations and conveniences, and has a present (1890) population of 15,700.

STAMMERING, or STUTTERING, designates a spasmodic affection of the organs of speech in which the articulation of words is suddenly checked and a pause ensues, often followed by a repetition in rapid sequence of the particular sound at which the stoppage occurred. Of this painful affection there are many grades, from a slight inability to pronounce with ease certain letters or syllables, or a tendency to hesitate and to interject unmeaning sounds in a spoken sentence, to the more severe condition in which there is a paroxysm of spasms of the muscles, not only of the tongue and throat and face, but even of those of respiration and of the body generally. Speech is the result of various muscular movements affecting the current of air as it passes in expiration from the larynx through the mouth. If the vocal cords are called into action, and the sounds thus produced are modified by the muscular movements of the tongue, cheeks, and lips, we have vocal speech; but if the glottis is widely open and the vocal cords relaxed the current of air may still be molded by the muscular apparatus so as to produce speech without voice or whispering (see VOICE). In both cases, however, the mechanism is very complicated, requiring a series of nervous and muscular actions, all of which must be executed with precision and in accordance.

Stammering is occasionally hereditary. It rarely shows itself before the age of four or five years, and as a rule it is developed between this age and puberty. Men stammer in a much larger proportion than women. It may occur during the course of nervous affections, such as hysteria, epilepsy, or tabes dorsalis; sometimes it follows febrile disorders; often it develops in a child in a feeble state of health, without any special disease. In some cases a child may imitate a stammerer and thus acquire the habit. Any general enfeeblement of the health, and especially nervous excitement, aggravates the condition of a confirmed stammerer. Stammerers, as a rule, find the explosive consonants *b*, *p*, *d*, *t*, *k*, and hard *g* the most difficult to articulate, but many also are unable easily to deal with the more continuous consonants, such as *v*, *f*, *th*, *s*, *z*, *sh*, *m*, *n*, *y*, and in severe cases even the vowels may cause a certain amount of spasm. Usually the defect is not observed in whispering or singing; but there are exceptions to this statement.

The most distressing cases are those in which the spasm extends to parts unconnected with speech—it may be to nearly the whole muscular organism. In such a case the spasm commences, let us assume, at the base of the tongue; the mouth opens widely and remains in that position; the muscles of expiration work convulsively; the glottis contracts; respiration becomes arrested; the face becomes congested and the veins dilated; violent spasmodic movements involve the trunk and limbs; and only after some time, either when the patient becomes exhausted, or when he resolutely restrains his attempts to articulate, does his paroxysm come to an end.

Stuttering may be successsfully overcome in some cases by a careful process of education under a competent tutor. Not a few able public speakers were at first stutterers, but a prolonged course of vocal gymnastics has remedied the defect. The patient should be encouraged to read and speak slowly and deliberately, carefully pronouncing each syllable, and when he feels the tendency to stammer, he should be advised to pause for a short time, and then by a strong voluntary effort to attempt to pronounce the word. He should also be taught how to regulate respiration during speech, so that he may not fail from want of breath. In some cases aid may be obtained by raising the voice toward the close of the sentence. Sounds or combinations of sounds that present special difficulties should be made the subject of careful study, and the defect may be largely overcome by a series of graduated exercises in reading. The practice of intoning is useful in many cases. In very severe cases, where the spasmodic seizures affect other muscles than those of articulation, special medical treatment is necessary, as such are on the borderland of serious nervous disturbance. All measures tending to improve the general health, the removal of any affection of the mouth or gums that may aggravate habitual stammering, the avoidance of great emotional excitement, a steady determination to overcome the defect by voluntary control, and a system of education such as has been sketched will do much in the great majority of cases to remedy stammering.

STAMPS. The stamp duty is a tax imposed upon a great variety of legal and other documents, and forms a branch of the national revenue.

Stamp duties are either fixed, such as the duty of one penny on every check, irrespective of its amount, or *ad valorem*, as the duty on a conveyance, which varies according to the amount of the purchase money. The duty is denoted generally by an impressed, less frequently by an adhesive, stamp, sometimes by either at the option of the person stamping. As a general rule a document must be stamped at the time of execution, or a penalty (remissible by the commissioners of inland revenue) is incurred. Some instruments cannot be stamped at all after execution, even with payment of the penalty. Such are bills of exchange and promissory notes (where an impressed stamp is necessary), bills of lading, proxies for voting at meetings of proprietors of joint-stock companies, and receipts after a month from date. An unstamped instrument cannot be pleaded or given in evidence except in criminal proceedings or for a collateral purpose. Certain offenses, such as forging a die or stamp, selling or using a forged stamp, etc., are made felonies punishable with penal servitude for life as a maximum.

The stamp duties of the United States are now under the superintendence of the commissioner of internal revenue. These duties, which depend upon a great body of statutory law, will be found in the Revised Statutes, tit. xxxv.

STANDARDS. See WEIGHTS AND MEASURES.

STANFIELD, WILLIAM CLARKSON, marine painter, was born of Irish parentage at Sunderland in 1794. He was elected an associate of the Royal Academy in 1832 and an academician in 1835; and until his death, May 18, 1867, he contributed to its exhibitions a long series of powerful and highly popular works, dealing mainly with marine subjects, but occasionally with scenes of a more purely landscape character.

Among these may be named—the *Battle of Trafalgar* (1836), executed for the United Service Club; the *Castle of Ischia* (1841), *Isola Bella* (1841), among the results of a visit to Italy in 1839; *French Troops Fording the Margra* (1847), the "*Victory*," *Bearing the Body of Nelson, Towed into Gibraltar* (1853), the *Abandoned* (1856).

STANFORD (THE LELAND, JUNIOR), UNIVERSITY, is an institution of learning located near San Francisco, Cal. It was founded in 1885 by the Hon. Leland Stanford, United States senator from that State, in response to the suggestion of Leland Stanford, Jr., who, however, died in Europe before such suggestion took practical shape. The institution, in addition to its academic features, is designed as a memorial to the deceased. Its purpose is to furnish a university education to students, male and female; to promote learning, the arts, sciences, agriculture, mechanical training, and generally "to qualify students for personal success and direct usefulness in life." In pursuance of these objects, Senator Stanford secured the passage by the California legislature in 1885 of the "Endowment Act," and in accordance with its provisions he nominated a board of trustees composed of the leading and representative men of the State, who are charged with the execution of all duties connected with the organization, conduct and management of the university. In November of the same year Senator Stanford conveyed to these gentlemen the "Palo Alto," "Gridley," and "Vina" farms, representing a total of 83,200 acres, situated in San Mateo, Santa Clara, Butte, and Tehama counties, and valued at many millions of dollars.

The articles of endowment, it might here be said, are, according to Senator Stanford, their author, intended to be in the nature of a constitution for the government and guidance of the board of trustees in a general manner—not in detail. The board is composed of twenty-four members, who, in the exercise of the trust committed to their care, are required to exclude sectarianism from the university; secure to both sexes an education equally full and complete; confer scholarships on students upon the basis of right; secure the lowest expenses to students; care for and improve the trust property, also to operate and lease it, applying the net proceeds of the same to the purposes of the trust created, and generally to do and perform all things necessary to the proper exercise and discharge of their duties. The departments will include a college of medicine, a college of law, a department wherein will be taught all the sciences and higher mathematics, a school of art, conservatory of music, school of mechanics, school of agriculture, etc., each presided over by the ablest professors, whose duty it will be to employ the most efficient methods for the attainment of the most valuable results. The curriculum of each department and school will be complete and comprehensive, and the branches taught such as to fully and completely meet the directions of the founder as above expressed.

Senator Stanford's intention is that the buildings shall be erected in the form of a parallelogram, to be constructed on a plan admitting of expansion and additions when the same shall become necessary. He has also provided a site at Palo Alto upon which residences shall be erected for the accommodation of parents and guardians of children, to be rented at a fair rental, the proceeds to be applied to the fund for the support of the university. Following the erection of the two first colleges, one for males and the other for females, will be the building of institutions in which will be given the higher course of education. They will be supplied with every appointment and convenience, and be free to post-graduates of all colleges and universities, also to such other deserving persons as the trustees may elect to admit. These improvements and the support of the institution will be paid for out of a fund derived from the products of the estate of 83,200 acres described above. To guard against any possible failure of the plan by death or other unexpected event, Senator and Mrs. Stanford have provided in their wills for further vast endowments of the institution, which, it is said, will afford a greater income than can ever be utilized.

Improvements have so far advanced that the university will be open for the reception of students in the fall of 1891.

STANHOPE, CHARLES STANHOPE, THIRD EARL, was born August 3, 1753, and educated under the opposing influences of Eton and Geneva, devoting himself while resident in the Swiss city to the study of mathematics, and acquiring from the associations connected with Switzerland an intense love of liberty. He contested the representation of the city of Westminster without success in 1774, when only just of age; but from the general election of 1780 until his accession to the peerage March 7, 1786, he represented through the influence of Lord Shelburne the Buckinghamshire borough of High Wycombe, and during the sessions of 1783 and 1784 he gave his support to the administration of William Pitt, whose sister, Lady Hester Pitt, he married on December 19, 1774.

He was the chairman of the "Revolution Society" founded in honor of the Revolution of 1688, the members of which in 1790 expressed their sympathy with the aims of the French republicans. He brought forward in 1794 the case of Muir, one of the Edinburgh politicians who were transported to Botany Bay, and in 1795 he introduced into the Lords a motion deprecating any interference with the internal affairs of France. In all of these points he was hopelessly beaten, and in the last of them he was in a "minority of one"—a sobriquet which stuck to him throughout life—whereupon he seceded from parliamentary life for five years. Lord Stanhope died at the family seat of Chevening, Kent, December 15, 1816.

Earl Stanhope was elected a fellow of the Royal Society so early as November, 1772, and devoted a large part of his income to experiments in science and philosophy. He invented a method of securing buildings from fire (which, however, proved impracticable), the printing press and the lens which bear his name, and a monochord for tuning musical instruments, suggested improvements in canal locks, made experiments in steam navigation in 1795–97, and contrived two calculating machines. Electricity was another of the subjects which he studied, and the volume of *Principles of Electricity* which he issued in 1779 contained the rudiments of his theory on the "return stroke" resulting from the contact with the earth of the electric current of lightning, which were afterward amplified in a contribution to the *Philosophical Transactions* for 1787. His principal labors in literature consisted of a reply to Burke's *Reflections on the French Revolution* (1790) and an *Essay* on the rights of juries (1792), and he long meditated the compilation of a digest of the statutes.

STANHOPE, LADY HESTER LUCY, the eldest child of the third Earl Stanhope (noticed above), by his first wife, Lady Hester Pitt, eldest daughter of the first earl of Chatham, was born March 12, 1776, and dwelt at her father's seat of Chevening, in Kent, until early in 1800, when his excitable and wayward disposition drove her to her grandmother's house at Burton Pynsent. While she remained on English soil happiness found no place in her heart, and her native land was finally abandoned for the East in February, 1810. After many wanderings she settled on Mount Lebanon, and from this solitary position she wielded an almost absolute authority over the surrounding districts. Lady Hester Stanhope's strength slowly wasted away, and at last she died on June 23, 1839, aged sixty-three. The disappointments of her life, and the necessity of overawing her servants as well as the chiefs who surrounded Djoun, had intensified a temper naturally imperious. In appearance as in voice she resembled her grandfather, the first Lord Chatham, and like him she domineered over the circle, large or small in which she was placed.

STANHOPE, PHILIP DORMER, fourth earl of Chesterfield. See CHESTERFIELD.

STANISLAU (Pol., *Stanislavoff*), the chief town in the district of the same name in Galicia, Austria, on the Albrecht and Lemberg-Czernowitz railways, in 49° 4′ N. latitude, 24° 30′ E. longitude, has two real-schools, a gymnasium, and large ironworks. It has also a good trade in grain. The population (1889) numbered 18,626.

STANISLAUS, king of Poland. Stanislaw Leszczynski or Leszinski was born at Lemberg on October 20, 1677. Stanislaus, after visiting the courts of Vienna, Paris, and Rome, was raised to the dignity of voivode of Posen, and in 1704 was sent as ambassador by the assembly of Warsaw to Charles XII. of Sweden, who had just declared the deposition of the recently elected Augustus II. The king was so greatly taken with the ambassador that he recommended him to the diet as a suitable candidate for the vacant throne; the election accordingly followed July 12, 1704, but the coronation of Stanislaus and his wife Catherina Opalinska did not take place until October 4th of the following year (compare POLAND). After the reverse of Poltava in 1709 Augustus returned to Poland, and, assisted by the Russians, compelled Stanislaus to leave the country. In 1725 his daughter Maria became the wife of Louis XV. of France. On the death of Augustus in 1733 Stanislaus once more returned to Poland, where a majority declared for him, but his competitor, the young elector of Saxony, had the advantage of the support of the emperor Charles VI., and also of the empress of Russia. Dantzic, to which Stanislaus had retired, was quickly taken by the Russians and the Saxons, and with great difficulty the unfortunate prince succeeded in making good his escape in disguise, after hearing that the Russians had set a price on his head. In 1736, when peace was concluded between the emperor and France, it was agreed that Stanislaus should abdicate the throne, but that he should be acknowledged king of Poland and grand-duke of Lithuania, and continue to bear these titles during life. He died at Lunéville on February 23, 1766, in consequence of injuries received from his nightdress accidentally taking fire.

Stanislaus, who was a patron of the arts and sciences, wrote several works in politics and philosophy, which were collected and published at Paris in 1763, in two volumes octavo, under the title *Œuvres du Philosophe Bienfaisant*. The *Œuvres Choisies de Stanislas, Roi de Pologne, Duc de Lorraine et de Bar*, with an historical notice by Madame de Saint-Ouen, were published in an octavo volume at Paris in 1825.

STANISLAUS AUGUSTUS, the last king of Poland, was born at Wolczyn in Lithuania in 1732 and died at St. Petersburg in 1798. See PONIATOWSKI and POLAND.

STANLEY, ARTHUR PENRHYN, dean of Westminster from 1863, was born at Alderley in Cheshire on December 13, 1815. At the age of fourteen his health, at one time alarmingly delicate, so far improved as to warrant his parents in sending him to Rugby, where he remained from 1829 to 1834. In 1834 he became an undergraduate of Balliol College, Oxford, having obtained a scholarship in the previous year. In 1839, after a period of residence and study at Oxford, he was elected fellow of University College, and in the same year was admitted to holy orders. In 1840 he left England for a prolonged tour in Greece and Italy, and on his return settled at Oxford, where he resided from October, 1841, for the next ten years, being actively engaged during term time as tutor of his college. His literary reputation was early established by the profound impression made by his *Life of Arnold*, whose sudden death had occurred in 1842, and whose biography, published in 1844, at once secured for its young author a high place among English writers. In 1845 he was appointed select preacher, and published in 1847 a volume of *Sermons and Essays on the Apostolic Age*, which not only laid the foundation of his fame as a preacher, but also marked his future position as a theologian.

As an undergraduate he had entirely sympathized with Doctor Arnold in resenting the agitation led by, but not confined to, the High Church party in 1836, against the appointment of Doctor Hampden to the regius professorship of divinity. As a young M.A., during the long-continued agitation which followed the publication in 1841 of Tract No. 90, and which ended in the withdrawal of the present Cardinal Newman from the English Church, he used all his influence to protect from formal condemnation the leaders and tenets of the "Tractarian" party. In 1847 he did his utmost to resist the movement set on foot at Oxford against Doctor Hampden's appointment to the bishopric of Hereford. Finally, in 1850, in an article published in the *Edinburgh Review* in defense of the "Gorham judgment," which had secured the position in the English Church of the Evangelical clergy, he asserted two principles which he maintained to the end of his life—first, "that the so-called supremacy of the crown in religious matters was in reality nothing else than the supremacy of law," and, secondly, "that the Church of England, by the very condition of its being, was not High, or Low, but Broad, and had always included, and been meant to include, opposite and contradictory opinions on points even more important than those at present under discussion." Subsequently he was appointed to a canonry in Canterbury cathedral and held the office from 1851 till his return to Oxford. During his residence at Canterbury he published his *Memoir* of his father, Bishop Stanley (1851), and completed his

Commentary on the Epistles to the Corinthians (1855). In the winter and spring of 1852-53 he made the tour in Egypt and the Holy Land, the result of which was his well-known volume on *Sinai and Palestine*, first published in 1856. In 1857 he traveled in Russia, and collected much of the materials for his subsequent *Lectures on the Greek Church*, published in 1861. At the close of 1856 Stanley was appointed by the crown to the professorship of ecclesiastical history, a post which, with the canonry at Christ Church attached to the office, he held till 1863. In the first of three inaugural lectures the new professor announced his intention of beginning his treatment of the subject with "the first dawn of the history of the church," the call of Abraham; and the first two volumes of his *History of the Jewish Church*, published in 1863 and 1865, consist of the substance of lectures delivered by him in his capacity as professor.

Much, however, of his time and efforts was given to religious controversy. From 1860 to 1864 academical and clerical circles were agitated by the storm which followed the publication of *Essays and Reviews*, a volume to which two of his most valued friends—Benjamin Jowett and Mr. Temple, the former professor of Greek at Oxford, the latter head master of Rugby and afterward bishop in succession of Exeter and London—had been contributors. For the exceedingly prominent part taken by Stanley in this exciting controversy the reader is referred to the second and third of his *Essays on Church and State*, collected and published in 1870. The result of his action was greatly to alienate the leaders of the High Church party, who had joined a large portion of the clergy in their efforts to procure the formal condemnation of the views advanced in *Essays and Reviews*. In this and other questions, such as in the growing controversy on the position of Professor Maurice at King's College, Cambridge, and on that caused by Bishop Colenso's work on the Pentateuch, he had taken up a position which brought him into conflict with a large portion of the religious public. It should be added that in the last year of his professoriate (1863) he had published a *Letter to the Bishop of London*, strongly advocating a large relaxation of the terms of clerical subscription to the Thirty-nine Articles and Prayer-book. An important Act amending the Act of Uniformity, and carrying out in some degree Stanley's proposals, was passed in the year 1865.

In the spring of 1862, Stanley, at the queen's desire, had accompanied the prince of Wales on a tour in Egypt and the Holy Land. Toward the close of the following year he was appointed by the crown to the deanery of Westminster, in succession to Dean Trench, raised to the see of Dublin. In December he married Lady Augusta Bruce, sister of Lord Elgin, then governor-general of India, herself one of the queen's most trusted friends. In January, 1864, he entered on the duties of his new post. Within three years of his appointment he published his *Memorials of Westminster Abbey*, a work which, although not free from occasional inaccuracies, is a mine of information conveyed in the most picturesque and impressive form. He was a constant preacher, and gave a great impulse to the practice already begun of inviting distinguished preachers to the abbey pulpit, especially to the evening services in the nave, which had been established under his predecessor. He was untiring in literary work, and, though this consisted very largely of occasional papers, lectures, articles in reviews, addresses, and sermons, it included a third volume of his *History of the Jewish Church*, a volume on the *Church of Scotland*, another of *Addresses and Sermons*, preached in America, and an exceedingly important volume, completed within a few months of his death, on *Christian Institutions*.

In 1874 he spent part of the winter in Russia, whither he and Lady Augusta had gone to take part in the marriage of the duke of Edinburgh. In the spring of 1876, after a long and lingering illness, he lost his wife. It was a terrible blow, and one from which he never entirely recovered. But in 1878 he was deeply interested by a tour in America, and in the following autumn visited for the last time, with his sister, Mary Stanley, who died before the close of the same year, northern Italy and Venice. In the spring of 1881 he preached funeral sermons in the abbey on Mr. Carlyle and Lord Beaconsfield, winding up with the latter a series of *Sermons preached on Public Occasions*, mainly on the death or funeral of eminent Englishmen, which form a volume singularly characteristic of his special gifts. He saw also the completion of the latest of his volumes, that already mentioned on *Christian Institutions*, and was in the course of the summer correcting for the press a paper on the *Westminster Confession*, and preaching in the abbey a course of Saturday *Lectures on the Beatitudes*. On July 10th he was attacked by a sudden illness, which in a few days assumed a more alarming character, and ended fatally on the 18th. The sensation caused by his death was profound and widespread. He was buried in Henry VII.'s chapel, in the same grave as his wife. His pall-bearers comprised representatives of literature, of science, of both Houses of Parliament, of theology, Anglican and Nonconformist, and of the Universities of Oxford and Cambridge. The recumbent monument placed upon the spot, and the windows in the chapter house of the abbey, one of them a gift from the queen, were a tribute to his memory from friends of every class in England and America.

The influence of Dean Stanley was no doubt largely due to his marvelous social gifts. But it would be impossible to speak even briefly of his literary position by itself. To write his life in full would be to give a sketch of English ecclesiastical history for a long generation. He believed, and was never tired of asserting his belief, "that the Christian church had not yet presented its final or its most perfect aspect to the world;" that "the belief of each successive age of Christendom had as a matter of fact varied enormously from the belief of its predecessor;" that "all confessions and similar documents are, if taken as final expression of absolute truth, misleading;" that each "successive form of theology is but the approximation to the truth, not the whole truth itself;" that it was "the glory of the church to be always advancing to perfection;" and that "there still remained, behind all the controversies of the past, a higher Christianity which neither assailants nor defenders had fully exhausted."

What was the extent, what the permanent force of his own influence, is a question not easily answered at present. "Dean Stanley," said Doctor Story, "stood higher in the respect and affection of a larger and more varied circle of members of many churches than any ecclesiastic in the world." It is not easy to disengage his personal and social charm, the affection borne him by all who had even momentarily passed within the circle of his striking and attractive individuality, the warm feelings which much in his life, much in his writings, had called forth from multitudes who never saw him, from the more abiding impression made during his lifetime and after his death by the writings which he has left behind him. Yet if, setting aside one single name, that of Professor Maurice, he be taken as the most prominent, the most fertile, the most gifted, and the most impressive exponent and defender of liberal theology, some estimate may be formed even now of the mark which he made upon his age. If the success achieved by the cause of which Stanley was the main representative is carefully weighed, it will be found to be great in solid and direct results, far greater probably in those which are less easily summed up and tabulated. On the questions which he had most at heart, the real and careful and critical study of the sacred records, the progress made since he first lectured as a tutor at Oxford on the Old and New Testaments has been enormous. The large majority of the works published have been written more or less in the spirit in which he would have largely or entirely sympathized. It may be added that of these there are few which would not have encountered, if not fierce criticism, yet at least grave suspicion, some forty years ago. The combination of a reverent treatment of Holy Scripture with fearless inquiry into all questions connected with its criticism is a new birth in English literature. It is one in which he took a leading part, and in the defense of which he bore, sometimes in his own behalf, oftener in chivalrous defense of others, much of the brunt of the earlier and later contests. The impulse which he gave to the study alike of the Bible and church history was a great one. In each he may be recognized, not of course as the originator, but as the representative, of a new school of thought and of treatment, and those who are most familiar with his writings can hardly open a new book by any English theologian, hardly read a sermon of many preachers, above all on any portion of the Old Testament, in which they do not trace his immediate influence. He may be said in a very true sense to color the writings of many of those who most differ from him. The subjects to which he looked as the most essential of all—the universality of the Divine love, the supreme importance of the moral and spiritual elements of religion, the supremacy of conscience, the sense of the central citadel of Christianity as being contained in the character, the history, the spirit of its Divine Founder—have beyond doubt, if not yet taken fully the place which he claimed for them, yet impressed themselves more and more on the teaching and the preaching of every class of clergy in the church. They have lifted the teaching of those who most differed from him far above the level of a mechanical or merely ceremonial form of mediæval worship. The great cause, too, for which he strove so hard, that of comprehension and mutual toleration, the true "enlargement of Christ's church," has gained much from his efforts—much in the present, and perhaps, in spite of some appearances to the contrary, more in the future. Whatever storms of party strife may be in store for the church, active and energetic Christians of opposite parties no longer waste their energies in mutual attacks, but have learned to work together in Christian teaching and in works of Christian beneficence. His surviving friends may rejoice to remember that no one person had, for, it may be, many generations, done so much as Stanley to draw together in friendly and social intercourse the leaders of various religious parties and of different denominations of Christians.

STANTON, Edwin McMasters, known as "the great war secretary," born at Steubenville, Ohio, December 19, 1814, died at Washington, D. C., December 24, 1869. He attended Kenyon College at Gambier, Ohio, from 1831 to 1833, leaving that institution to study law. In 1836 Mr. Stanton was admitted to the bar and began practice at Cadiz. In 1837 he was elected prosecuting attorney of Harrison county, remaining in that capacity until 1839, when he returned to Steubenville, whence he was appointed reporter of the Supreme Court of Ohio. During 1848 he located at Pittsburgh, Pa., removing thence to Washington city in 1859. Upon the promotion of Jeremiah S. Black as secretary of state to fill the vacancy caused by the resignation of Lewis Cass in 1860, Stanton was appointed attorney general and became a member of President Buchanan's cabinet.

It was at this period of intense excitement growing out of the proposed withdrawal of the United States troops garrisoning the forts in Charleston harbor that Stanton first came into prominence as a public man. He vehemently denounced John B. Floyd, then secretary of war, at a cabinet meeting at which the subject matter was discussed, and declared that such practical surrender of government property would be an act of treason deserving of the severest penalties. Upon the accession of President Lincoln, Stanton resumed the practice of law, but in January, 1862, when Simon Cameron resigned the war secretaryship to accept the Russian mission, Stanton became his successor. His administration was characterized by vigorous action throughout, though his policy in connection with the Peninsular campaign was in some instances severely criticised, and evoked from General McClellan a sharp letter. After General Grant's victory at Fort Donelson, Stanton recommended him for promotion, and in the autumn of the same year directed that officer to take command of the armies of the Southwest.

He called General Grant to the command of the army in 1864, but continued to exercise his official prerogative in directing operations until the close, even dissuading President Lincoln, so it is said, from permitting General Grant to make peace with Lee some weeks prior to the surrender, which, it was said at the time, could have then been accomplished. When Andrew Johnson succeeded to the presidency, as will be recalled, a serious disaffection arose between the executive and congress, growing out of the reconstruction policy adopted by the latter. Secretary Stanton sided with congress and the president demanded his resignation. The refusal of Stanton was followed by his suspension, and he remained inactive until January, 1868, when he resumed his duties in accordance with directions from the senate. In February following, the president advised the senate of his suspension of Stanton and the appointment of a secretary *ad interim*. Stanton, however, declined to recognize the right of the president in the premises, in which course he was sustained by the senate. The impeachment of the president followed, also his acquittal and the final retirement of Secretary Stanton from public life. He resumed the practice of the law, and on December 20, 1869, was appointed a justice of the Supreme Court, but died four days later. He was an officer of unyielding determination, absolutely fearless, and of impregnable integrity. His public services cannot be too highly estimated.

STARAYA RUSSA, a district town of Russia, in the government of Novgorod, sixty-two miles to the south of that city, on the river Polist, by means of which and Lake Ilmeñ it is brought into easy steamer communication with St. Petersburg. Some brine springs, of no great strength, on the eastern side of the town, were used as a source for the supply of salt as late as 1865, yielding about 50,000 hundredweights annually; at present they are used only as mineral waters, having a great resemblance to those of Kreuznach. Some thousands of visitors resort to them every summer, and owing to this circumstance Staraya Russa is better built and kept than any other town in Novgorod. The 13,100 inhabitants are supported chiefly by the summer visitors. About 100 individuals in all employ themselves in brick-making, tanning, and sawing timber, and there is a trade in rye, oats, and flax shipped to St. Petersburg to the value of about $250,000 per annum.

STARCH is an organized product of the vegetable kingdom, forming one of the most important and characteristic elements of plant life, and an abundantly stored reserve material for the discharge of vegetative functions. It originates within the living vegetable cell through the formative activity of chlorophyl under the influence of light, and is consequently an unfailing characteristic of all plants containing that body (compare PHYSIOLOGY). Starch found within leaves and other green parts of plants is assimilated and transformed with great rapidity; accumulations of it are carried as starch-formers, and redeposited as starch in special reservoirs or portions of plants as the period of maturity approaches. In this way the body is found to gorge the stems of certain palms—the sago, etc.—just before these plants begin to form their fruit; it is the principal constituent of the underground organs of biennial and perennial plants, tap-roots, root-stocks, corms, bulbs, and tubers; and it is abundantly stored in many fruits and seeds, as in the cereals and pulses, in bananas, bread-fruit, etc. It is only slightly acted on by cold water, but under the influence of heat in water it swells up, forming according to the proportions of starch and water a clouded opalescent paste. In its chemical relations starch consists of an intimate mixture of two isomeric bodies—granulose and starch cellulose—or rather of a series of gradations from the one to the other, the starch cellulose being principally in the external layers, while the granulose is found in the central portions of the granules. Starch cellulose is a body intermediate between granulose and ordinary cellulose; from the latter it is distinguished by being reducible to soluble starch by boiling in water and by digesting in caustic alkali. Together, the substances consist of a combination of carbon with hydrogen and oxygen.

As an economic product starch in its separate condition is a most important alimentary substance, the chief pure food starches being ARROWROOT, SAGO, TAPIOCA, (*qq.v.*), and corn-flour, the starch of the MAIZE, (*q.v.*) In its combined condition, in cereals, etc., starch is certainly the greatest and foremost of all the elements of nutrition (compare DIETETICS and NUTRITION). In its other industrial relations starch is used (1) directly, as a thickening material in calico printing, for the dressing and finishing of many textiles, for laundry purposes, adhesive paste, and powder; and (2) indirectly, for the preparation of dextrine and British gum and starch-sugar. Maize, wheat, and rice starch are principally employed for the direct applications; and for the dextrine and starch-sugar manufacture potato starch is almost exclusively selected.

Potato starch is prepared principally by carefully washing the potatoes and in a kind of rasping machine reducing them to a fine pulp, which is deposited in water as raw starch. The impurities of this starch—cellulose, albuminoids, fragments of potato, etc.—are separated by washing it in fine sieves, through the meshes of which the pure starch alone passes. The starch is then received in tanks, in which it settles, and so separates from the soluble albuminoids and salts of the potatoes. After the starch has settled, the brown-colored supernatant liquor is drawn off and the starch again washed either in tanks or in a centrifugal machine. Finally it is dried by spreading it in layers over porous bricks (a process not required in the case of starch washed in a centrifugal machine) and by exposure to the air, after which it still retains a large proportion of water, but is in a condition for making dextrin or starch-sugar. For further drying it is ground to a rough powder, and dried thoroughly in a hot chamber, then reduced to a powder and sifted. A method of reducing potatoes to a pulp by slicing and heaping them up till fermentation takes place is said to give a large yield of starch, but it is not much practiced. Wheat starch is separated in two different ways—(1) the fermentation method, which is the original process, and (2) by mechanical means without preliminary fermentation. In the fermentation process whole wheat or wheaten meal is softened and swollen by soaking in water. Wheat grains are, in this condition, ground, and the pulp, mixed to a thickish fluid with water, is placed in tanks, where it ferments, developing acetic and volatile acids which dissolve the gummy constituents of the wheat, with part of the gluten, and render the whole less tenacious. After full fermentation, the period of which varies with the weather and the process employed, the starch is separated in a washing drum. It is subsequently washed with water, which dissolves out the gluten, the starch settling in two layers—one comparatively pure, the other mixed with gluten and some branny particles. These layers are separated, the second undergoing further washing to remove the gluten, etc., and the remaining operations are analogous to those employed in the preparation of potato-starch. By the mechanical process wheaten flour is kneaded into a stiff paste, which, after resting for an hour or two, is washed over a fine sieve so long as the water passing off continues milky, whereby the starch is liberated and the greater part of the gluten retained as a gluey elastic mass in the sieve. The starch is subsequently purified by fermentation, washing, and treatment in centrifugal machines. The gluten thus preserved is a useful food for diabetic patients, and is make with flour into artificial macaroni and pastes, besides being valuable for other industrial purposes.

Maize starch is obtained by analogous processes, but, the proportion of gluten in the grain being smaller, and less tenacious in its nature, the operations, whether chemical or mechanical, present fewer difficulties. Under one method the separation of maize starch is facilitated by steeping, swelling, and softening the grain in a weak solution of caustic soda, and favorable results are also obtained by a process in which the pulp from the crushing mill is treated with water acidulated with sulphurous acid.

In the preparation of rice-starch a weak solution of caustic soda is also employed for softening and swelling the grain. It is then washed with pure water, dried, ground, and sifted, and again treated with alkaline water, by which the whole of the nitrogenous constituents are taken up in soluble form. An acid process for obtaining rice-starch is also employed, under which the grain, swollen and ground, is treated repeatedly with a solution of hydrochloric acid, which also dissolves away the non-starchy constituents of the grain. The laundry starches now in use are principally made from rice and from pulse.

STAR-CHAMBER, the name given in the fifteenth, sixteenth, and seventeenth centuries to an English high court of justice, consisting of the members of the ordinary council, or of the privy council only, with the addition of certain judges, and exercising jurisdiction, mainly criminal, in certain cases. The origin and early history of the court are somewhat obscure. It was in the reign of Edward III. that we first hear of the "chancellor, treasurer, justices, and others" exercising jurisdiction in the "star-chamber" or "chambre de estoiles" at Westminster. In Henry VI.'s reign one Danvers was acquitted of a certain charge by the king's council "in camera stellata." Hitherto such Acts of Parliament as had recognized this jurisdiction had done so only by way of limitation or prohibition, but in 1453, about the time when the distinction between the ordinary and privy council first became apparent, an Act was passed by which the chancellor was empowered to enforce the attendance of all persons summoned by the privy seal before the king and his council in all cases not determinable by common law. At this time, then, the jurisdiction of the council was recognized as supplementary to that of the ordinary law-courts. But the anarchy of the Wars of the Roses, and the decay of provincial justice owing to the influence of great barons and the turbulence of the lower classes, obliged parliament to intrust wider powers to the council. This was the object of the famous Act of 3 Hen. VII., which was quoted by the lawyers of the Long Parliament as creating the court of star-chamber.

The jurisdiction thus intrusted to a committee of the council was not, therefore, like that granted in 1453, supplementary, but superseded the ordinary law courts in cases where they were too weak to act. The court established by the Act 3 Hen. VII. continued to exist for about fifty years, but disappeared toward the end of Henry VIII.'s reign. A court not unlike that created in 3 Hen. VII. was erected in 1540. The uncertain composition of the court is well displayed by Coke, who says that the star-chamber is or may be compounded of three several councils—(1) the lords and others of the privy council; (2) the judges of either bench and the barons of the exchequer; (3) the lords of parliament, who are not, however, standing judges of the court. Hudson (temp. Car. I.), on the other hand, considers that all peers had a right of sitting in the court. In practice its jurisdiction was almost unlimited. It took notice of maintenance and liveries, bribery or partiality of jurors, falsification of panels or of verdicts, routs and riots, murder, felony, forgery, perjury, fraud, libel and slander, offenses against proclamations, duels, acts tending to treason, as well as of a few civil matters—disputes as to land between great men or corporations, disputes between English and foreign merchants, testamentary cases, etc.—in fact, "all offenses may be here examined and punished if the king will" (Hudson). Its procedure was not according to the common law; it dispensed with the incumbrance of a jury; it could proceed on mere rumor or examine witnesses; it could apply torture; it could inflict any penalty short of death. It was thus admirably calculated to be the support of order against anarchy or of despotism against individual and national liberty. During the Tudor period it appeared in the former light, under the Stuarts in the latter. It was abolished by the Long Parliament in 1641, and was never afterward revived.

STARGARD, an ancient manufacturing town in eastern Pomerania, Prussia, is situated on the left bank of the navigable Ihna, twenty miles to the east of Stettin. Stargard has a considerable market for cattle and horses, and carries on trade in grain, spirits, and raw produce. Its manufactures include cigars, tobacco, wadding, and stockings; and there are also iron foundries and linen and woolen factories in the town. The population in 1885 was 22,109 (in 1816 8,706), of whom about 730 were Roman Catholics and about 560 Jews.

STARLING (A.S. *Stær*, *Stearn* and *Sterlyng;* Lat. *Sturnus;* Fr. *Étourneau*), a bird long time well known in most parts of England, and now, through the extension of its range within the present century, in the rest of Great Britain, as well as in Ireland, where, though not generally distributed, it is very numerous in some districts. It is about the size of a thrush, and, though at a distance it appears to be black, when near at hand its plumage is seen to be brightly shot with purple, green, and steel-blue, most of the feathers when freshly grown being tipped with buff. These markings wear off in the course of the winter, and in the breeding season the bird is almost spotless. It is the *Sturnus vulgaris* of ornithologists.

A more engaging bird scarcely exists, for its familiarity during some months of the year gives opportunities for observing its ways that few others afford, while its varied song, its sprightly gestures, its glossy plumage, and, above all, its character as an insecticide—which last makes it the friend of the agriculturist and grazier—render it an almost universal favorite. For a resident, the Starling is rather a late breeder. The nest is commonly placed in the hole of a tree or of a building, and its preparation is the work of some little time. The eggs, from four to seven in number, are of a very pale blue, often tinged with green. As the young grow they become very noisy, and their parents, in their assiduous attendance, hardly less so, thus occasionally making themselves disagreeable in a quiet neighborhood. The Starling has a wide range over Europe and Asia, reaching India; but examples from Kashmir, Persia, and Armenia have been considered worthy of specific distinction, and the resident Starling of the countries bordering the Mediterranean is generally regarded as a good species, and called *S. unicolor* from its unspotted plumage.

Of the many forms allied to the genus *Sturnus*, some of which have perhaps been needlessly separated therefrom, those known as Grackles have been already mentioned, and there is only room here to notice one other, *Pastor*, containing a beautiful species *P. roseus*, the Rose-colored Starling, which is not an infrequent visitor to the British Islands. It is a bird of most irregular and erratic habits—a vast horde suddenly arriving at some place to which it may have hitherto been a stranger, and at once making a settlement there, leaving it wholly deserted as soon as the young are reared.

STARODUB, a district town of Russia, in the government of Tchernigoff, 116 miles to the northeast of that town, on the marshy banks of a small tributary of the navigable Sudost. It is regularly built, with broad straight streets, the houses being surrounded by large gardens. Its 23,890 inhabitants—Little Russian descendants of former Cossacks, with about 5,000 Jews—support themselves chiefly by gardening and agriculture. Tanning is also carried on, and the trade in grain and hemp exported to Riga and St. Petersburg has some importance.

STARO-KONSTANTINOFF, a district town of Russia, in the government of Volhynia, situated 121 miles to the west-southwest of Zhitomir. It is an old-fashioned, poorly built town, dating from the sixteenth century, and is often mentioned in history in connection with the rising of Cossacks under Bogdan Khmelnitzky. Owing to its excellent position close to the Austrian frontier and its railway communication with southwest Russia, it has a very active trade in grain, cattle, and salt with Austria, Prussia, and Poland. Its population (17,980 in 1884, of whom two-thirds were Jews) is rapidly increasing.

STASSFURT, a town in the Prussian province of Saxony, and one of the chief seats of the German salt-producing industry, is situated on both sides of the Bode, nineteen miles to the southwest of Magdeburg. The first attempt to bore for salt was not made until 1839, while the systematic exploitation of the salt-beds, to which the town is indebted for its prosperity, dates only from 1856. The shafts reached deposits of salt at a depth of 850 feet, but the finer and purer layers lie more than 1,100 feet below the surface. Besides the rock-salt, which is excavated by blasting, the saline deposits of Stassfurt yield a considerable quantity of deliquescent salts and other saline products, which have encouraged the foundation of numerous chemical factories in the town and in the neighboring village of Leopoldshall, which stands upon Anhalt territory. The formation of the Stassfurt salt-beds and the composition of the rock-salt are described under SALT. The rock-salt works are mainly government property, while the chemical factories are in private hands. About 2,000 workmen are employed in the Stassfurt salt industry, and about 490,000 tons of raw salt are annually excavated. The population of the town, which contains one or two miscellaneous factories, was 16,457 in 1885.

STATE, GREAT OFFICERS OF. All the principal ministers of the British crown are popularly called the great officers of state. Under this designation are more or less accurately included the premier for the time being, the other members of the cabinet, and the leading functionaries of the court. But properly speaking the great officers of state are only nine in number, and it is to the holders of them alone that the description of "the great officers of state" strictly and distinctively applies. They are the lord high steward, the lord high chancellor, the lord high treasurer, the lord-president of the privy council, the lord-keeper of the privy seal, the lord great chamberlain, the lord high constable, the earl marshal, and the lord high admiral. Of these, three—the lord chancellor, the lord-president of the council, and the lord privy seal—are the first and second always and the third almost always cabinet ministers. It is of the great offices of the steward, the chamberlain, the constable, and the marshal that we shall at present speak, the rest of those we have mentioned being dealt with under their proper headings, or in the articles CABINET, MINISTRY, PRIVY COUNCIL, and ROYAL HOUSEHOLD.

The lord high steward of England ranks as the first of the great officers of state. His office is called out of abeyance by commission under the great seal only for coronations and for trials by the House of Lords. At the former he bears the crown of St. Edward immediately before the sovereign in the procession to Westminster Abbey, and he presides at the latter on the arraignment of a peer or a peeress for treason or felony. From the reign of Richard II. to that of Henry VII. it was the duty of the lord high steward to sit judicially in the court of claims to hear and determine all claims, to render services of grand serjeanty to the king or queen at his or her coronation. Since the accession of the house of Tudor, however, this function has generally been discharged by a specially appointed commission, or a committee of the privy council. John of Gaunt may be regarded, in fact, as the creator of the lord high stewardship and all its privileges and prerogatives as they have existed from his days to our own. The lord great chamberlain of England ranks as the sixth great officer of state. Whenever the sovereign attends the palace of Westminster the keys are delivered to him, and he is for the time in command of the building. At the opening or closing of the session of parliament by the sovereign in person he disposes of the sword of state to be carried by any peer he may select, and walks himself in the procession on the right of the sword of state, a little before it and next to the sovereign. He assists at the introduction of all peers into the House of Lords on their creation, and at the homage of all bishops after their consecration. At a coronation he receives the regalia from the dean and chapter of Westminster, and distributes them to the personages who are to bear them in the ceremony. On that day it is his duty to carry the sovereign his shirt and wearing apparel before he rises and to serve him with water to wash his hands before and after dinner. The office was hereditary in the Veres, earls of Oxford, from the reign of Henry I. to the reign of Charles I., when it passed through an heiress to the Berties, Lords Willoughby de Eresby, and afterward earls of Lindsey and dukes of Ancaster, and from the Berties it was transmitted through coheiresses to the present inheritors of the dignity.

The lord high constable of England ranks as the seventh of the great officers of state. His office is called out of abeyance for coronations alone, when it is his duty to assist in the reception of the regalia from the dean and chapter of Westminster, and during the coronation banquet to ride into Westminster Hall on the right hand of the champion. The constable was originally the commander of the royal armies and the master of the horse. He was also one of the judges of the court of chivalry or court of honor.

The earl marshal of England ranks as the eighth of the great officers of state. He is the head of the college of arms, and has the appointment of the kings-of-arms, heralds, and pursuivants at his discretion. He attends the sovereign in opening and closing the session of parliament, walking opposite to the lord great chamberlain on his or her right hand. It is his duty to make arrangements for the order of all state processions and ceremonials, especially for coronations and royal marriages and funerals. Like the lord high constable he rides into Westminster Hall with the champion after a coronation, taking his place on the left hand, and with the lord great chamberlain he assists at the introduction of all newly-created peers into the House of Lords. He exercised joint and coördinate jurisdiction with the constable in the court of chivalry, and afterward became the sole judge of that tribunal. The marshalship of England was made hereditary in the Clares and Marshals, earls of Pembroke, in the reign of Stephen or Henry II., and through a coheiress passed to the Bigots, earls of Norfolk, and by Roger Bigot, fifth earl of Norfolk, it was surrendered with his other dignities to Edward I. It was granted by Edward II. to his brother Thomas of Brotherton, earl of Norfolk, and, after it had been variously disposed of by Edward III., was by Richard II. erected into an earldom and conferred on Thomas Mowbray, duke of Norfolk, who was the great-grandson and heir of Thomas of Brotherton. One of the coheiresses of the Mowbrays was the mother of John Howard, duke of Norfolk, who was created earl marshal by Richard III. After several attainders and partial restorations in the reigns of the Tudors and the Stuarts, the earl marshalship was finally entailed by Charles II. on the male line of the Howards, with many specific remainders and limitations, under which settlement it has regularly descended to the present duke of Norfolk.

STATEN ISLAND, an island of New York State, forming, with some adjacent islands, Richmond county, with a population of 38,991 in 1880, is situated about five miles south of New York city, from which it is separated by New York Bay, while the Narrows, commanded by Forts Wadsworth and Tompkins and a line of water-batteries, separate it from Long Island on the northeast, Staten Island Sound from New Jersey on the west, and Newark Bay and the Kill van Kull from the same State on the north. It is of an irregular triangular shape, its greatest length being about thirteen miles, its greatest breadth about eight, and the total area fifty-eight and one-half square miles. The surface is gently undulating, but a range of hills attaining 310 feet in height extends across the northern portion. Iron ore is found. The island contains many detached villa residences of persons in business in New York. On an artificial island off the east shore is the New York quarantine establishment, and Staten Island is the seat of the "Sailors' Snug Harbor," a retreat for superannuated seamen. Steam ferries ply half-hourly to New York, and on the island there is a railway line from Tompkinsville to Tottenville.

STATE PAPERS. See RECORDS, PUBLIC.

STATES RIGHTS. From the incipiency of the constitution of the United States there have always been two opposing sentiments in regard to the limitation of the powers of the central government of the United States, and the line of demarcation where the coercive authority of the general government begins and the reserved rights of the States end has always been a subject of rancorous dispute. The advocates of these two diametrically opposed ideas had each his own argument for and against the respective issues. One party denounced the establishment of a strong federal government as but a few steps removed from the establishment of a despotism, while the other characterized the voluntary mutual compact which might be dissolved at will as a rope of sand. During the earlier years of the French Revolution congress had assumed control over certain aliens in some of the States and forbidden certain seditious practices by these aliens. This had led to the proposed nullification of the national legislation by the States involved, and had opened anew the vexed question as to how far the national government had jurisdiction over the citizens and denizens of the various States. The national party claimed that the national government's authority was not limited to the subjects specified in the constitution, but also extended to all collateral circumstances, that in the remotest degree affected the proper execution and exercise of these powers. The strict constructionists, or States rights people, while willing to extend the authority of the government to necessary incidents of the delegated powers, at the same time insisted that authority over individuals within the bounds of the respective States was neither expressed nor implied. This agitation had convinced all thoughtful men that it was necessary to define and extend the powers of congress.

In 1787 a convention was called and plans were submitted to it for the reconstruction of the government. The larger States, led by Virginia, proposed a national government, the authority of which was to be received from the people, and was to be confined to certain subjects, but on those subjects the national authority was to be supreme and to override all other powers. This plan, based on popular representation, was opposed by the smaller States, led by New Jersey, which proposed a voluntary association of States—in fact, reducing the general government to the position of a mere diplomatic bureau for the transaction of mutual treaties or agreements between the States—a bureau whose enactments should have no further authority in the territories of each State than the State government saw fit to delegate. A third plan was that of Alexander Hamilton, the arch-priest of Federalism, who proposed the erection of a government with unlimited powers. This plan was not submitted to the convention. The form of government finally adopted was a modification of the Virginia plan, in which one branch of the legislative body was the creature of popular representation, while a second or upper house was established which represented the States in their sovereign capacity as bodies politic, and independent members of a federation.

Even at the earliest stages of the formation of the government a conflict of interests between the north and the south was apparent—particularly on the questions which afterward, in 1861, precipitated the civil war. The passage of the alien and sedition laws was the first of a long series of actions which inflamed the public mind on the subject of the limits of the powers of congress. This was succeeded in 1832 by the nullification acts of South Carolina. From that time onward the history of the country was one continual struggle in regard to the important question of States rights, until finally the matter was settled, partially at least, by four years of bloodshed, which by force of arms and the logic of events have greatly extended the original powers of the government. The first State to declare the doctrine of States rights formally was Kentucky, which by resolutions in 1798 enunciated the doctrine that the States were not united on the principle of unlimited submission to the general government, but on the principle of a mutual compact that each State was the best judge of the extent to which she was bound by the enactments of congress, and that each State was also the best judge of the manner of redress for any infraction of her rights by the national government. In the same year the Virginia legislature passed resolutions, which, while endorsing the action of Kentucky in the premises, went further and declared that the States have the right and are in duty bound to resist any encroachments of the national government on their rights. Virginia also transmitted copies of the resolutions to the legislatures of the other States and called on them for cöoperation. She received replies from seven of the States dissenting from the position of Virginia, and in consequence of this the subject was taken up and reconsidered; but the action of 1798 was endorsed on the subsequent consideration, the argument and report of the committee charged with the matter having been drawn up by Mr. Madison. Almost every species of legislation by the United States congress was twisted and distorted into an infraction of the rights of the States, and with each succeeding year the contest grew more and more rancorous, as the conflicting interests of the two sections of the Union grew more and more apparent. At last the great culminating point in the drama was reached when in 1860 South Carolina attempted to do what had only been threatened before—dissolve the compact between the Federal Government and the States. This proposition of right to retire from the Union at will was decidedly negatived, as was also the right to hold slaves in contravention to national authority. Curiously enough, however, a decision of the United States Supreme Court since the war contained the declaration that the rights of the States were in no wise affected save as regards the right to slaves. This of course is based on the position that the claims put forth in regard to other rights were false and erroneous *ab initio*.

STATES OF THE CHURCH, or PAPAL STATES (Ital. *Stato della Chiesa*, *Stato Pontificio*, *Stato Romano*, *Stato Ecclesiastico;* Fr. *États de l'Église*, *Pontificat Souverain de Rome*, etc.; Germ. *Kirchenstaat;* in ecclesiastical Latin often *Patrimonium Sancti Petri*), that portion of central Italy which, previous to the unification of the kingdom, was under the direct government of the see of Rome.

With the exception of Benevento, surrounded by the Neapolitan province of Principato, Ulteriore, and the small state of Pontecorvo, inclosed within the Terra di Lavoro, the States of the Church formed a compact territory, bounded on the northwest by the Lombardo-Venetian kingdom, on the northeast by the Adriatic, on the southeast by the kingdom of Naples, on the southwest by the Mediterranean, and on the west by the grand-duchy of Tuscany and the duchy of Modena. On the Adriatic the coast extended 140 miles, from the mouth of the Tronto (Truentus) to the southern mouth of the Po, and on the Tyrrhenian Sea, 130 miles, from 41° 20′ to 42° 22′ N. latitude.

The question of the origin of the territorial jurisdiction of the pope has been treated under POPEDOM. The States of the Church were of course submerged for a time by the ground-swell of the French Revolution, but they appeared again in 1814. In 1849 they received a constitution. On the formation of the kingdom of Italy, in 1860, they were reduced to the Comarca of Rome, the legation of Velletri, and the three delegations of Viterbo, Cività Vecchia, and Frosinone; and in 1870 they disappeared from the political map of Europe.

STATICS. See MECHANICS.

STATIONERY. Under the name of stationery are embraced all writing materials and implements, together with the numerous appliances of the desk and of mercantile and commercial offices. In addition to these, the term fancy stationery covers a miscellaneous assemblage of leather and other goods, such as pocket-books, purses, bags, card-cases, and many kindred objects which cannot be classified. The principal articles and operations of the stationery trade are dealt with in detail under separate headings—BOOKBINDING, EMBOSSING, INK, LITHOGRAPHY, PAPER, PEN, PENCIL, SEALING-WAX, etc.; but in connection with the separate industry of a commercial stationer there are a number of special operations and machines to which brief allusion may be made.

The ruling of the blue and other colored lines is usually done on a self-feeding machine provided with as many ruling pens as there are lines to be made, and these fixed in parallel order at intervals the width of the ruled spaces. The pens consist of grooved slips of sheet brass coming to a fine point, which in their upper part are covered by a sheet of felt saturated with a flowing ink, whence each pen obtains the supply required for tracing its line. The paper is carried forward by endless tapes or threads which pass around cylinders. In a recent form of machine the rulers consist of metal discs with thin edges, which take up printing ink from an india-rubber cylinder, and print the lines on the paper as it passes around a revolving cylinder.

In making envelopes the blanks are first cut out by shaped cutters or punches acting at one stroke on a thickness of from 200 to 300 sheets of paper. These blanks in the latest form of machine are gummed by a pad which takes gum from a roller and presses it on the edges of the paper, just as printing ink is received from cylinders and pressed on paper in printing. The gummed surface of the pad lifts each blank separately, places it under a plunger, which, descending, passes it to folders, whence it is delivered into a clip in an endless band of considerable length. The envelopes are delivered into the clips in the band at the rate of about 100 to 150 per minute. The idea of perforating paper so as to allow of the ready detaching of portions by tearing was conceived and patented in 1848 by Mr. Henry Archer. Of such utility was Mr. Archer's conception deemed by the post-office authorities as a convenience for detaching stamps from sheets that in 1853 he was awarded $20,000 for his patent rights. The applications of perforation are now very numerous, but its value still remains most obvious in connection with the detachment of adhesive stamps from sheets. Numbering and paging constitute another series of stationery operations, for which ingenious machines have been devised. For consecutive numbering a series of printing disks are employed, on the periphery of which the series of digits 1 to 0, are raised; the outer disk moves a number after each impression, the second disk moves once in ten times, and so on, thus automatically imprinting consecutive numbers up to the limit of the disks on the machine. Such a machine prints only on one side of the paper, and where the numbering is required on both sides the disks must be geared to move two places, numbering only odd or even numbers, two printings being thus required. For printing right and left consecutively an endless band machine is used, which prints alternately below and above for the two sides of the sheet.

STATISTICS. The word "statistic" is derived from the Latin *status*, which, in the so-called Middle Ages, had come to mean a "state" in the political sense. "Statistic," therefore, originally denoted inquiries into the condition of a state. Since the beginning of the eighteenth century the denotation of the word has been extended so as to include subjects only indirectly connected with political organizations, while at the same time the scope of the investigations it implies has become more definite, and at the present day may be said, for practical purposes, to be fixed, though there are still controversies as to the position of statistical studies in relation to other departments of scientific procedure.

The origin of what is now known as "statistic" (Ger., *Die Statistik;* Fr., *La Statistique;* Ital., *Statistica*) can only be referred to briefly here. As M. Maurice Block has observed in commencing his admirable treatise, "it is no exaggeration to say that statistic has existed ever since there were states." For the first administrative act of the first regular government was probably to number its fighting men, and its next to ascertain with some degree of accuracy what amount of taxation could be levied on the remainder of the community. As human societies became more and more highly organized, there can be no doubt that a very considerable body of official statistics must have come into existence, and been constantly used by statesmen, solely with a view to administration.

Statistics, or rather the material for statistics, therefore existed at a very early period, but it was not until within the last three centuries that systematic use of the information available began to be made for purposes of investigation and not of mere administration. According to M. Block, the earliest work in which facts previously known only to government officials were published to the world was a volume compiled by Francesco Sansovino, entitled *Del Governo et Amministrazione di Diversi Regni et Republiche*, which was printed in Venice and bears the date 1583.

In the year 1660 Hermann Conring, "professor of medicine and politics," in the university of Helmstädt, was in the habit of giving lectures in which he analyzed and discussed the circumstances existing in various countries, in so far as they affected the happiness of the inhabitants. Conring's example was followed by other writers, in Germany and elsewhere. The best-known member of the "descriptive" school was Achenwall (1719–1772), who is sometimes spoken of as "the father of modern statistics," but, as his procedure was essentially the same as that of Conring, though it was carried out more fully, the title has not been unanimously granted. It is generally admitted, however, that Achenwall's work gave a great impulse to the pursuit of the studies which are now included under the title of statistics.

In any case statistics, in the modern sense of the word, did not really come into existence until the publication by J. P. Süssmilch, a Prussian clergyman, of a work entitled *Die göttliche Ordnung in den Veränderungen des Menschlichen Geschlechts aus dem Geburt, dem Tode, und der Fortpflanzung desselben er-*

wiesen. In this book a systematic attempt was made to make use of a class of facts which up to that time had been regarded as belonging to "political arithmetic," under which description some of the most important problems of what modern writers term "vital statistics" had been studied, especially in England. Süssmilch had arrived at a perception of the advantage of studying what Quetelet subsequently termed the "laws of large numbers." He combined the method employed by the Conring-Achenwall school of "descriptive statistics," whose works were not unlike modern school-books of geography, with that of the "political arithmeticians," who had confined themselves to investigations into the facts regarding mortality and a few other similar subjects, without much attempt at generalizing from them. But nevertheless his work was a most valuable one, since it pointed out a road which others who had no desire to procure evidence in favor of a particular system of thought were not slow to follow.

M. Block is of opinion that the descriptive school, by whom figures are regarded merely as accessories to and illustrations of the text, would have maintained its position even now but for the establishment of official statistical offices and the influence of the great Belgian Quetelet. Quetelet's work was certainly "epoch-making" in a far higher degree than that of any of his predecessors. To the impulse created by him must be attributed the foundation in 1835 of the Statistical Society of London, a body which has had a considerable and very useful influence on the practical work of carrying out statistical investigations in the United Kingdom and elsewhere. The influence exercised by Quetelet on the development of statistics is clearly seen from the fact that, though there is still considerable controversy among statisticians, the old controversary between the "descriptive" and arithmetical schools has disappeared.

The clearest and shortest definition of the science of statistics as thus conceived is that of M. Block, who describes it as "la science de l'homme vivant en société en tant qu'elle peut être exprimée par les chiffres." He proposes to give a new name to the branch of study thus defined, namely, "Demography." Mayr's definition is longer. He defines the statistical science as "die systematische Darlegung und Erörterung der thatsächlichen Vorgänge und der aus diesen sich ergebenden Gesetze des gesellschaftlichen menschlichen Lebens auf Grundlage quantitativer Massenbeobachtungen" (the systematic statement and explanation of actual events, and of the laws of man's social life that may be deduced from these, on the basis of the quantitative observation of aggregates). Gabaglio's view is practically identical with those adopted by Mayr and Block, though it is differently expressed. He says "Statistics may be interpreted in an extended and in a restricted sense. In the former sense it is a methed, in the latter a science. As a science it studies the actual social-political order by means of mathematical induction."

This discussion regarding the nature of statistics is to a large extent a discussion about names. There is really no difference of opinion among statistical experts as to the subject-matter of statistics, the only question being—shall statistics be termed a science as well as a method?

The Statistical is a scientific procedure (1) whereby certain phenomena of aggregation not perceptible to the senses are rendered perceptible to the intellect, and (2) furnishing rules for the correct performance of the quantitative observation of these phenomena. The class of phenomena of aggregation referred to includes only such phenomena as are too large to be perceptible to the senses. It does not, *e.g.*, include such phenomena as are the subject-matter of microscopy. Things which are very large are often quite as difficult to perceive as those which are very small. A familiar example of this is the difficulty which is sometimes experienced in finding the large names, as of countries or provinces, on a map. Of course the terms "large," "too large," "small," and "too small" must be used with great caution, and with a clear comprehension on the part of the person using them of the standard of measurement implied by the terms in each particular case. A careful study of the first few pages of De Morgan's *Differential and Integral Calculus* will materially assist the student of statistics in attaining a grasp of the principles on which standards of measurement should be formed. It is not necessary that he should become acquainted with the calculus itself, or even possess anything more than an elementary knowledge of mathematical science, but it is essential that he should be fully conscious of the fact that "large" and "small" quantities can only be so designated with propriety by reference to a common standard.

Sources whence Statistics are Derived.—The term "statistics" in the concrete sense means systematic arrangements of figures representing "primary statistical quantities." A primary statistical quantity is a number obtained from numbers representing phenomena, with a view to enable an observer to perceive a certain other phenomenon related to the former as whole to parts. They represent either a phenomenon of existence at a given point of time or a phenomenon of accretion during a given period. As examples may be mentioned the number of deaths in a given district during *a given time*, the number of dollars received by the Chicago and North-Western railway during a given time, and the number of "inches of rain" that fell at Peoria during a given time. Other examples are the number of tons of pig iron lying in a particular store at *a given date*, the number of persons residing (the term "residing" to be specially defined) in a given territory at a given date, and the number of dollars representing the "private deposits" of the First National Bank at a given date.

Primary Statistical Quantities are the result of labors carried on either (A) by governments or (B) by individuals or public or private corporations.

A. *Government Statistics.*—(1) A vast mass of statistical material of more or less value comes into existence automatically in modern states in consequence of the ordinary administrative routine of departments. To this class belong the highly important statistical information published in the United States by the census commission, the returns of pauperism issued by the local governments, the reports of inspectors of prisons, factories, schools, and those of sanitary inspectors, as well as the reports of the commissioners of the customs, and the annual statements of trade and navigation prepared by the same officials. There are also the various returns compiled and issued by the Board of Trade, which is the body most nearly resembling the statistical bureaus with which most foreign governments are furnished. Most of the government departments publish some statistics for which they are solely responsible as regards both matter and form. All these sets of primary statistical quantities arise out of the ordinary work of departments of the public service. Many of them have been in existence, in some form or other, ever since a settled government existed in the country.

B. The primary statistical quantities for which individuals or corporations are responsible may be divided into three categories.

(1) Among those which are compiled in obedience to the law of the land are the accounts furnished by municipal corporations, by railway, gas, water, banking,

insurance and other public companies making returns to the various State governments—usually either to an insurance or bank commissioner or to the secretary of commonwealth—by trades unions, and by other bodies. The information thus obtained is published in full by the departments receiving it, and is also furnished by the companies themselves to their proprietors or members.

(2) An enormous mass of statistical information is furnished voluntarily by public companies in the reports and accounts which, in accordance with their articles of association, are presented to their proprietors at stated intervals. With these statistics may be classed the figures furnished by the various trade associations, some of them of great importance.

(3) There are cases in which individuals have devoted themselves with more or less success to obtaining original statistics on special points. The great work done by Messrs. Behm and Wagner in arriving at an approximate estimate of the population of the earth does not belong to this category, though its results are really primary statistical quantities. Many of these results have not been arrived at by a direct process of enumeration at all, but by ingenious processes of inference. It need hardly be said that it is not easy for individuals to obtain the materials for any primary statistical quantity of importance, but it has been done in some cases with success.

STATIUS, Publius Papinius, Roman poet, lived from about 45 to 96 A.D., so far as can be judged from indications afforded by his poems. He was, to a great extent, born and trained to the profession of a poet. The Statii were of Græco-Campanian origin, and were gentle, though impoverished, and the family records were not without political distinctions.

As a poet, Statius unquestionably shines in many respects when compared with the other post-Augustans. He was born with exceptional talent, and his poetic expression is, with all its faults, richer on the whole and less forced, more buoyant and more felicitous, than is to be found elsewhere in the Silver Age of Latin poetry. Statius is at his best in his occasional verses, the "*Silvae*," which have a character of their own, and in their best parts a charm of their own. The title was proper to verses of rapid workmanship, on everyday themes. Statius prided himself on his powers of improvisation, and he seems to have been quite equal to the Horatian feat of dictating 200 lines in an hour, while standing on one leg. The improvisatore was in high honor among the later Greeks, as Cicero's speech for the poet Archias indicates; and the poetic contests common in the early empire did much to stimulate ability of the kind.

STATUTE, or Act, is a law made by the sovereign power in the state. It forms a part of the *lex scripta*, or written law, which by English legal authorities is used solely for statutory law, a sense much narrower than it bore in Roman law. To make a statute the concurrence of the executive and the two houses of the legislature is necessary. The construction or interpretation of statutes depends partly on the common law, partly on statute. The main rules of the common law, as gathered from the best authorities, are these: (1) Statutes are to be construed, not according to their mere letter, but according to the intent and object with which they were made. (2) The relation of the statute to the common law is to be considered. In the words of the resolution of the Court of Exchequer in Heydon's Case, 3 *Coke's Rep.*, 7, the points for consideration are—"1, What was the common law before the making of the Act? 2, What was the mischief and defect against which the common law did not provide? 3, What remedy the parliament hath resolved and appointed to cure the disease of the Commonwealth? 4, The true reason for the remedy." (3) Beneficial or remedial statutes are to be liberally, penal more strictly, construed. (4) Other statutes *in pari materia* are to be taken into consideration. (5) Where the provision of a statute is general, everything necessary to make such provision effectual is implied. (6) A later statute repeals an earlier, as far as the two are repugnant, but, if they may stand together, repeal will not be presumed. (7) There is a presumption against creation of new or ousting of existing jurisdictions, against impairing obligations, against retrospective effect, against violation of international law, against monopolies, and in general against what is inconvenient or unreasonable. (8) If a statute inflicts a penalty, the penalty implies a prohibition of the act or omission for which the penalty is imposed. Whether the remedy given by statute is the only one depends on the words of the particular Act. In some cases an action or an indictment will lie; in others the statutory remedy, generally summary, takes the place of the common law remedy. In some few instances the courts have construed the imposition of a penalty as operating not to invalidate a contract but to create a tax upon non-compliance with the terms of the statute.

By the constitutions of many of the United States, English statute law, as it existed at the time of the separation from England, and as far as it is applicable, has been adopted as part of the law of the States. The United States and the State are not bound by an Act of Congress or a State law unless specially named. The States legislate for themselves within the limits of their own constitution and that of the United States. Here appears the striking difference between the binding force of a statute of the United Kingdom and an Act passed by congress or a State legislature. In the United Kingdom parliament is supreme; in the United States an Act is only of authority if it is in accordance with the constitution. The courts may declare an Act void if it contravene the constitution of the United States or of a State, so that practically the Supreme Court of the United States is the ultimate legislative authority. Examples of recent cases where the constitutionality of an Act has been contested will be found under Payment and Privilege. The restrictions upon legislation contained in the constitution of the United States provide against the suspension of the writ of habeas corpus, except in case of rebellion or invasion, the passing of a bill of attainder or *ex post facto* law, the imposition of capitation or other direct tax, unless in accordance with a previous article of the constitution, or of a tax or duty on exports, the preference of the ports of one State over those of another, the drawing of money from the treasury except by appropriations made by law, and the grant of a title of nobility. The amended constitution contains further limitations, *e.g.*, the taking of private property for public use without just compensation, and the abridging of the right of citizens on account of race, color, or previous condition of servitude. State legislation is limited by § 10:—"No State shall * * * * * make anything but gold and silver coin a tender in payment of debts, pass any bill of attainder, *ex post facto* law, or law impairing the obligation of contracts, or grant any title of nobility." The section further forbids imposition of duties on imports or exports or any duty of tonnage without consent of congress. State constitutions often contain further restrictions; among the more usual are provisions against laws with a retrospective operation, or impairing the obligation of contracts, or dealing with more than one subject to be expressed in the title. The time when a statute is to take effect after its passing is often fixed by State constitutions. The statutes of the United States were revised under the powers of an Act of Congress passed in 1874 (sess. i. c. 333), and the volume of *Revised Statutes* (frequently amended since) was issued on February 22, 1875. Many of the States have also issued revised editions of their statutes. The rules of construction are in general agreement with those adopted in England. See Sedgwick, *Statutory Law*.

International Law.—The term statute is used by international jurists and civilians to denote the whole body of the municipal law of the State. In this sense statutes are either real, personal, or mixed. A real statute is that part of the law which deals directly with property, whether movable or immovable. A personal statute has for its object a person, and deals with questions of status, such as marriage, legitimacy, or infancy. A mixed statute affects both property and person, or, according to some authorities, it deals with acts and obligations. Personal statutes are of universal validity; real statutes have no extra-territorial authority. The determination of the class under which a particular law ought to fall is one of great difficulty, and one in which there is often a conflict of legal opinion. On the whole the division appears to have created more difficulties than it has solved, and it is rejected by Savigny as unsatisfactory. See Story, *Conflict of Laws*, §§ 12–16; Phillimore, *International Law*, vol. iv. ch. xvi.

STATUTE MERCHANT AND STATUTE STAPLE were two old forms of security, long obsolete in practice, though references to them still occur in some modern statutes. They were originally permitted only among traders, for the benefit of commerce, but afterward extended by 23 Hen. VIII. c. 6, to all subjects, whether traders or not. The creditor under either form of security was allowed to seize the goods and hold the lands of a defaulting debtor until satisfaction of his debt. While he held the lands he was termed tenant by statute merchant or by statute staple. In addition to the loss of his goods and lands the debtor was liable to be imprisoned.

STAUNTON, the capital of Augusta county, Va., and one of the most delightful cities in the Shenandoah valley, is situated almost at the base of the Blue Ridge mountains, 136 miles northwest of Richmond, 40 miles west of Charlottesville, the location of the University of Virginia, and 60 miles north of Lynchburg. During the war Staunton was the scene of frequent occupation by both armies, and the rendezvous for commands which participated in campaigns that have made the Valley the subject of poetic and romantic contributions to the history of times that yet live in the memory of survivors. The city contains a court-house, two national banks with a total cash capital of $300,000, and $225,000 surplus, six weekly papers, one monthly magazine, ten churches, a high school, and a number of educational institutions of almost national reputation, including the Staunton Female Seminary, Augusta Female Seminary, the Virginia Female Institute, and an institute under the auspices of the Methodist society of the State. Staunton is also the location of the State Insane, and Deaf and Dumb asylums, the latter affording the means of educating between 800 and 1,000 pupils, also of the Staunton Iron Works, and a number of minor industries. The city is the center of a territory possessing large agricultural resources, and adjacent to White Sulphur, Bath Alum, Augusta, and other mineral springs, noted for their medicinal qualities, as also contiguous to Weir's Cave and Cave of the Fountains, with which it is connected by stage. The city's population, 6,800 in 1880, had increased to 8,000 in 1890.

STAUNTON, HOWARD, Shakespearean scholar and writer on chess, was born about 1810. He died in London June 22, 1874.

STAVANGER, a seaport town of Norway, the administrative center of an "amt" of the same name (population 114,164 in 1876), is situated on the west coast, on the south side of a beautiful fjord, about 127 miles northwest of Christiansand. In 1801 the population of Stavanger was only 2,500; by 1855 it was 12,000, and by 1875 20,350.

STAVROPOL, a government of Northern Caucasia, Russia, having an area of 26,530 square miles, and a population (rapidly increasing by Russian immigration) last returned at 637,893. It is bounded by Astrakhan and the province of the Don Cossacks on the north, Kubañ on the west, Terek on the south, and the Caspian Sea on the east, occupying the eastern part of the broad plains and steppes which fringe the main chain of CAUCASUS (*q.v.*) on the north.

There are three administrative districts, the chief towns of which are Stavropol (35,470 inhabitants), Pyatigorsk (11,115), and Alexandrovskaya (8,710), and a territory of nomad natives which occupies more than two-fifths of the entire area of the government.

The educational returns show seven gymnasiums and "real schools," with 1,081 boys and 491 girls, and 139 elementary schools, with only 5,310 boys and 1,034 girls.

Agriculture is the chief occupation of the settled population, and so large is the harvest that no less than 16,000 laborers, attracted by high wages, come annually from European Russia to assist in gathering in the crops. Large amounts of grain are exported both to the mountainous districts of Caucasus and to Russia (Rostoff-on-the-Don). Cattle-breeding is engaged in very largely, not only by the Kalmucks, Turcomans, and Nogais, but also by the Russians. Cattle and horses, as also wool, hair, hides, and sheepskins, are exported in considerable quantities. A remarkable feature of Stavropol is the rapid growth among the Russian peasant population of a great variety of domestic trades, both for local supply and for exportation. Silk wares are now woven in the villages to such an extent as to become an important article of export to Russia. Many other petty trades have also grown up of late, such as various kinds of cotton-weaving, the manufacture of leather wares, small metallic wares, and so on.

STAVROPOL, capital of the above province, is situated on a plateau 2,000 feet above the sea, on the northern slope of the Caucasus, 360 miles to the northwest of Tiflis and 914 miles from Moscow. It is connected by rail with Rostoff-on-the-Don. Although founded only in 1776 for military purposes, it has rapidly grown, and has now a population of 35,500, while it is one of the best built provincial towns of the Russian empire.

STEAM-ENGINES AND OTHER HEAT-ENGINES. A heat-engine is a machine in which heat is employed to do mechanical work. In all practical heat-engines, work is done through the expansion by heat of a fluid which overcomes resistance as it expands—in steam-engines by the expansion of water and water-vapor, in air-engines by the expansion of hot air, in gas-engines by the expansion of a burnt mixture of air and gas. One of the most simple and historically one of the oldest types of heat-engines are guns, in which heat, generated by the combustion of an explosive, does work in giving energy of motion to a projectile. But guns differ so widely from all other types, both in their purpose and in their development, that it is convenient to leave them out of account in treating of engines which may serve as prime movers to other mechanism.

EARLY HISTORY OF THE STEAM-ENGINE.—The earliest notices of heat-engines are found in the *Pneumatica* of Hero of Alexandria, (*c.* 130 B.C.) Two contrivances described there deserve mention. One is the æolipile, a steam reaction turbine consisting of a spherical vessel pivoted on a central axis and supplied with steam through one of the pivots. The steam escapes by bent pipes facing tangentially in opposite directions, at opposite ends of a diameter perpendicular to the axis. The globe revolves by reaction from the escaping steam, just as a Barker's mill is driven by escaping water. Another apparatus described by Hero (fig. 1) is interesting as the prototype of a class of engines which long afterward became practically important. A hollow altar containing air is heated by a fire kindled on it; the air in expanding drives some of the water contained in a spherical vessel beneath the altar into a bucket, which descends and opens the temple doors above by pulling round a pair of vertical posts to which the doors are fixed. When the fire is extinguished the air cools, the water leaves the bucket, and the doors close. In another device a jet of water driven out by expanding air is turned to account as a fountain.

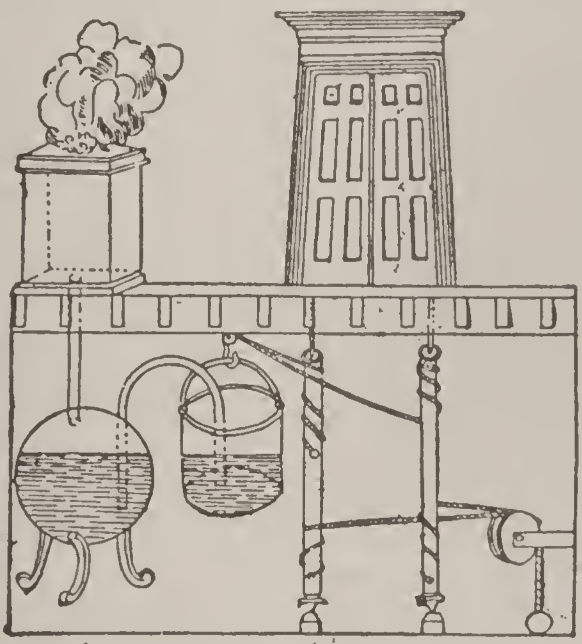


FIG. 1.—Hero's Apparatus, 130 B.C.

From the time of Hero to the seventeenth century there is no progress to record, though here and there we find evidence that appliances like those described by Hero were used for trivial purposes, such as organ-blowing and the turning of spits. The next distinct step was the publication in 1601 of a treatise on pneumatics by Giovanni Battista della Porta, in which he shows an apparatus similar to Hero's fountain, but with steam instead of air as the displacing fluid.

Another line of invention was taken by Giovanni Branca (1629), who designed an engine shaped like a water-wheel, to be driven by the impact of a jet of steam on its vanes.

The next contributor is one whose place is not easily assigned. To Edward Somerset, second marquis of Worcester, appears to be due the credit of making the first useful steam-engine. Its object was to raise water, and it worked probably like Della Porta's model, but with a pair of displacement-chambers, from each of which alternately water was forced by steam from an independent boiler, or perhaps by applying heat to the chamber itself while the other vessel was allowed to refill.

Success was reserved for Thomas Savery, who in 1698 obtained a patent for a water raising engine. Savery's engine was probably an improvement on Worcester's; in any case it found what Worcester's engine had failed to find—considerable employment in pumping mines and in raising water to supply houses and towns, and even to drive water-wheels. A serious difficulty which prevented its general use in mines was the fact that the height through which it would lift water was limited by the pressure the boiler and vessels could bear.

So early as 1678 the use of a piston and cylinder (long before known as applied to pumps) in a heat-engine had been suggested by Jean Heautefeuille, who proposed to use the explosion of gunpowder either to raise a piston or to force up water, or to produce, by the subsequent cooling of the gases, a partial vacuum into which water might be sucked up. Two years later Huygens described an engine in which the explosion of gunpowder in a cylinder expelled part of the gaseous contents, after which the cooling of the remainder caused a piston to descend under atmospheric pressure, and the piston in descending did work by raising a weight.

In 1690 Denis Papin, who ten years before had invented the safety-valve as an adjunct to his "digester," suggested that the condensation of steam should be employed to make a vacuum under a piston previously raised by the expansion of the steam. Papin's was the earliest cylinder and piston steam-engine, and his plan of using steam was that which afterward took practical shape in the atmospheric engine of Newcomen.

About 1711 Newcomen's engine began to be introduced for pumping mines; and in 1713 a boy named Humphrey Potter, whose duty it was to open and shut the valves of an engine he attended, made the engine self-acting by causing the beam itself to open and close the valves by suitable cords and catches. Potter's rude device was simplified in 1718 by Henry Beighton, who suspended from the beam a rod called the plug-tree, which worked the valves by means of tappets. By 1725 the engine was in common use in collieries, and it held its place without material change for about three-quarters of a century.

In 1763 James Watt, an instrument maker in Glasgow, while engaged by the university in repairing a model of Newcomen's engine, was struck with the waste of steam to which the alternate chilling and heating of the cylinder gave rise. He saw that the remedy, in his own words, would lie in keeping the cylinder as hot as the steam that entered it. With this view he added to the engine a new organ—an empty vessel separate from the cylinder, into which the steam should be allowed to escape from the cylinder; to be condensed there by the application of cold water either outside or as a jet. To preserve the vacuum in his condenser he added a pump called the air-pump, whose function was to pump from it the condensed steam and water of condensation, as well as the air which would otherwise accumulate by leakage or by being brought in with the steam or with the injection water. Then as the cylinder was no longer used as a condenser he was able to keep it hot by clothing it with non-conducting bodies, and in particular by the use of a *steam-jacket*, or layer of hot steam between the cylinder and an external casing. Further, and still with the same object, he covered in the top of the cylinder, taking the piston-rod out through a steam-tight stuffing-box, and allowed steam instead of air to press upon the piston's upper surface.

In a second patent (1781) Watt describes the "sun-and-planet" wheels and other methods of making the engine give continuous revolving motion to a shaft provided with a fly-wheel. He had invented the crank and connecting-rod for this purpose, but it had meanwhile been patented by one Pickard, and Watt, rather than make terms with Pickard, whom he regarded as a plagiarist of his own ideas, made use of his sun-and-planet motion until the patent on the crank expired. The reciprocating motion of earlier forms had served only for pumping; by this invention Watt opened up for the steam-engine a thousand other channels of usefulness. The engine was still single-acting; the connecting-rod was attached to the far end of the beam, and that carried a counterpoise which served to raise the piston when steam was admitted below it.

In 1782 Watt patented two further improvements of the first importance, both of which he had invented some years before. One was the use of double action, that is to say, the application of steam and vacuum to each side of the piston alternately. The other (invented as early as 1769) was the use of steam expansively, in other words the plan (now used in all engines that aim at economy of fuel) of stopping the admission of steam when the piston had made only a part of its stroke, and allowing the rest of the stroke to be performed by the expansion of the steam already in the cylinder. He further added the throttle-valve, for regulating the rate of admission of steam, and the centrifugal governor, a double conical pendulum, which controlled the speed by acting on the throttle-valve.

Among the contemporaries of Watt one name deserves special mention. In 1781 Jonathan Hornblower constructed and patented what would now be called a compound engine, with two cylinders of different sizes. Steam was first admitted into the smaller cylinder, and then passed over into the larger, doing work against a piston in each. In Hornblower's engine the two cylinders were placed side by side, and both pistons worked on the same end of a beam overhead. This was an instance of the use of steam expansively, and as such was earlier than the patent, though not earlier than the invention, of expansive working by Watt. Hornblower was suppressed by the Birmingham firm for infringing their patent in the use of a separate condenser and air pump. The compound engine was revived in 1804 by Woolf, with whose name it is often associated.

The adaption of the steam engine to railways, begun by Trevithick, became a success in the hands of George Stephenson, whose engine, the "Rocket," when tried along with others on the Stockton and Darlington road in 1829, not only distanced its competitors but settled once and for all the question whether horse traction or steam traction was to be used on railways. The principal features of the "Rocket" were an improved steam-blast for urging the combustion of coal and a boiler (suggested by Booth, the secretary of the railway) in which a large heating surface was given by the use of many small tubes through which the hot gases passed. Further, the cylinders, instead of being vertical as in earlier locomotives, were set in at a slope, which was afterward altered to a position more nearly horizontal. To these features there was added later the "link motion," a contrivance which enabled the engine to be easily reversed and the amount of expansion to be readily varied. In the hands of George Stephenson and his son Robert the locomotive took a form which has been in many essentials maintained by the heavier locomotives of to-day.

The first steamboat was the tug *Charlotte Dundas*, built by William Symmington, and tried in the Forth and Clyde canal in 1802. A Watt double-acting condensing engine, placed horizontially, acted directly by a connecting rod on the crank of a shaft at the stern, which carried a revolving paddle wheel. The trial was not entirely successful, and steam towing was abandoned for fear of injuring the banks of the canal. Ten years later Henry Bell built the *Comet*, with side paddle wheels, which ran as a passenger steamer on the Clyde; but an earlier inventor to follow up Symmington's success was the American, Robert Fulton, who, after unsuccessful experiments on the Seine, fitted a steamer on the Hudson in 1807 and brought steam navigation for the first time to commercial success.

The first step in the production of steam is to convert the potential energy of fuel into actual heat; the second step is to transfer the heat to water in the boiler. The efficiency of furnace and boiler is the ratio which the amount of heat taken up by the water bears to the whole potential energy of the fuel. In good boilers this efficiency is about 0.7. The loss is due partly to incomplete combustion of the fuel and partly to incomplete transfer of heat from the products of combustion to the boiler water. Under the first head may be classed—(1) waste of fuel in the solid state by bad stoking, and (2) waste of fuel in the gaseous and smoky states by imperfect combustion. Under the second head are comprised—(1) waste by external radiation and conduction, and (2) waste by heat contained in the hot gases which escape by the chimney, due (*a*) to their still high temperature and (*b*) to the fact that they contain as one of the products of combustion steam-gas, which passes away uncondensed. Loss of heat by the hot gases is the most important source of waste. Not only are the actual products of combustion rejected at a high temperature, but along with them goes the nitrogen of the air whose oxygen has been used, and also a quantity of additional air which is needed to dilute the products in order that combustion may be fairly complete. Roughly speaking, about twelve pounds of air are required to supply oxygen enough for the combustion of one pound of coal. Over and above this quantity, about twelve pounds more generally pass through the furnace as air of dilution. In furnaces with forced draught, in which the consumption of coal per square foot of grate surface is much more rapid, the air of dilution may be reduced to half or less than half of this quantity, though to some extent at the expense of completeness in the combustion.

The extent to which heat is taken from the hot gases depends on the *heating surface* through which heat passes into the water. The heating surface is made up of the surface of the furnace or combustion-chambers so far as that is brought into contact with the water, and of the flues or tubes through which the hot gases pass on their way to the chimney. Its efficiency depends on the conductivity of the metal, on the difference in temperature between the gases on one side and the water on the other, and on the freedom with which steam, when formed, can escape from the surface. Differences in specific conductivity and in thickness of metal affect the result less than might be expected, on account of the resistance which is offered to the passage of heat through the film of scale and also through the film of water vapor which forms on the metallic surface.

By extending the heating surface sufficiently the hot gases may be deprived of heat to an extent which is only limited by the temperature of the boiling water. This temperature, however, need not form a limit, for after leaving the boiler the gases may be further cooled by being brought into contact with a vessel termed a feed-water heater, through which the feed-water passes on its way to the boiler. Even with a feed-water heater, however, the temperature of the hot gases is never, in practice, reduced so low as that of the boiler.

In nearly all land engines and most marine engines the draught is produced by means of a chimney which acts in virtue of the column of air within it being specifically lighter than the air outside, so that the pressure within the chimney at its base is less than the atmospheric pressure at the same level outside. The composition of the chimney gases is such that they are heavier than air at the same temperature, and to make them sufficiently lighter to cause a draught they must retain a certain considerable portion of heat. On the other hand, if they are left too hot the mass of air drawn through the furnace is actually diminished, since then the chimney gases are so much expanded that the increased volume of the draught does not compensate for its diminished density. With a given chimney and furnace the maximum draught is obtained when the gases escape at a temperature about that of melting lead; by making the chimney more capacious a lower temperature will suffice to give the same draught, and this will of course increase the efficiency of the boiler.

In place of using a chimney draught depending merely on the temperature of the rejected hot gases, the air required for combustion and dilution may be forced through the furnace either by producing a partial vacuum in the chimney, or by supplying air to the grate at a pressure higher than that of the atmosphere. In locomotives, for example, a partial vacuum is produced in the chimney by means of a blast of exhaust steam from the engine; and in many naval and a few mercantile steamers a forced draught is produced by having a closed stokehole or a closed ashpit, which is supplied with air at a pressure above that of the atmosphere by the use of a blowing fan.

If heat were thoroughly extracted from the products of combustion, a forced draught would be more efficient, from the thermo-dynamic point of view, than a chimney draught, for a chimney is in fact an extremely inefficient heat-engine, and requires a very large amount of heat to be expended in order to effect the comparatively trifling work of maintaining the draught. But where forced draught has been substituted for chimney draught this has hitherto been done for the purpose of increasing not the efficiency but the *power* of boilers. The motive has been to burn more coal per square foot of grate surface and so to evaporate more water with a boiler of given weight. This is incompatible with very high efficiency. When more coal is burnt by forcing the draught it is true that the products of combustion have a higher temperature (since less air is required for dilution) and the effectiveness of the heating surface is therefore increased. But the heating surface has more hot gas to deal with, and the result is that the boiler is less efficient than when the draught is not forced. The same efficiency could be secured, with forced draught, by increasing the heating surface to a sufficient extent; and a still greater efficiency could be realized if the heating surface were still further enlarged so that the gases left the flues at a temperature lower than would be needful if the draught depended on the lightness of the chimney's contents. The most efficient boiler would be one in which the draught was forced by mechanical means, and the gases were then cooled as far as possible by contact with a very extensive heating surface, first in the boiler itself and then in a feed-water heater. None of the forced draught boilers that have hitherto been introduced have a heating surface so large as to make them more efficient than good chimney-draught boilers (in which the rate of combustion is much slower), although the heating surface bears a much larger ratio to the grate area than is usual with chimney draughts.

Most modern boilers are internally fired; that is to say, the furnaces are more or less completely inclosed within the boiler. Externally fired boilers are for the most part much less efficient than internally fired boilers; they are, however, used to a considerable extent where fuel is specially cheap or where the waste heat of other furnaces is to be utilized. Their usual form is that of a horizontal cylinder with convex ends; the strength both of the main shell and the ends is derived from their curvature, and no staying is necessary. The heating surface is entirely external and is of very limited extent.

A great variety of boilers have been designed in which the firing is external, and the water space consists of groups of tubes or other small sections whose outer surface is exposed to heat. Boilers of this type are called sectional or tubulous boilers, in distinction from tubular boilers, or boilers with tubes in which the hot gases circulate. A successful example of the tubulous or sectional type is the Babcock & Wilcox water-tube boiler, which consists of a series of inclined welded tubes up which water circulates. These are joined at their ends by cast-iron connecting boxes to one another and to a horizontal drum on the top in which the mixture of steam and water which rises from the tube undergoes separation. At the lowest point of the boiler is another drum for the collection of sediment. Root's boiler is another in which water is heated by circulating through inclined tubes exposed to the fire; it differs from the above form chiefly in having the water-level below the top of the tube. Harrison's boiler is a group of small globular vessels of cast-iron strung like beads on rods which tie them together. Sectional boilers may be constructed without difficulty to bear pressures greatly in excess of those for which other types are suited. Mr. Perkins has employed a tubulous boiler to deliver steam at a pressure of 500 pounds per square inch. The Herreshof boiler is a continuous coil of tube, arranged as a dome over the fire. Feed-water is pumped slowly through the coil, and turns to steam before it reaches the end.

The locomotive boiler consists of a nearly rectangular fire box inclosed above and on the sides by water, and a cylindrical part called the barrel extending horizontally from the fire box to the front part of the locomotive and filled with numerous tubes. The usual construction of a locomotive boiler is as follows:

The barrel contains the requisite number of tubes, of steel, and of a diameter proportional to purposes required. The front tube plate in which the tubes terminate is of steel stayed to the back tube plate by the tubes themselves, and the upper part of the front tube plate is also tied by longitudinal rods to the back end plate. The fire box is nearly rectangular, with a horizontal grate. A grate sloping down in front is often preferred. Round its sides, front, and back (except where the fire door interrupts) is a water space about three to five inches wide, which narrows slightly toward the bottom. The flat sides of the fire box are tied to the flat sides of the shell by stay bolts, four inches apart, which are secured by screwing them into both plates and riveting over the ends. The roof of the fire box is stiffened by a number of girders on the top, to which the plates are secured by short bolts. The girders are themselves hung from the top of the shell above them by slings which are secured to angle-irons riveted on the inside of the shell plates. A sloping bridge of fire brick sometimes partially separates the upper part of the fire box from the lower and prevents the flame from striking the tubes too directly. Under the grate is an ashpan, to which the supply of air is regulated by a damper in front. The fire door opens outward and can be set more or less open, to regulate the amount of air admitted above the fire. On top of the barrel is a steam dome, from which the steam supply is taken through a pipe traversing the forward part of the steam space and passing down to the valve chest through the smoke box. The stop valve or "regulator" is situated in the smoke box, and is worked by a rod through the boiler from the cab at the back. Above the fire box end of the shell are a pair of safety valves—two valves pressed down by a single spring attached to the middle of a crossbar, which is prolonged to form a hand lever by which the valves may be lifted. In front of the forward tube plate is the smoke box, containing the blast pipe by which the exhaust steam is used to produce a partial vacuum and so force a draught through the furnace.

So long as marine engines used steam of a pressure less than about thirty-five pounds per square inch the marine boiler was generally a box with flat sides, elaborately stayed, with a row of internal furnaces near the bottom opening into a spacious combustion chamber inclosed within the boiler at the back, and a set of return tubes leading from the upper part of the chamber to the front of the boiler, where the products of combustion entered the uptake and passed off to the funnel. The use of higher pressures has made this form entirely obsolete. The normal marine boiler is now a short circular horizontal cylinder of steel with flat ends, with internal furnaces in cylindrical flues, internal combustion chambers, and return tubes above the flues. In one variety, called the double-ended boiler, there are furnaces at both ends of the shell, each pair leading to a combustion chamber in the center that is common to both, or to separate central chambers with a water space between them. At each end there are three furnaces in flues made of welded corrugated steel plates. The use of corrugated plates for flues, introduced by Mr. Fox, makes thin flues able to resist collapse, and allows the flues to accommodate themselves easily to changes of temperature. One combustion chamber is common to each pair of furnaces. It is strengthened on the top by girder stays, and on the sides by stay bolts to the neighboring chamber and to the shell. The tubes are of iron, and a certain number of them are fitted with nuts so that they serve as stays between the tube plate of the combustion chamber and the front of the boiler. The upper part of the front plate is tied to the opposite end of the boiler by long stays. The uptakes from both ends converge to the funnel base above the center of the boiler's length. Each boiler has a steam dome, from which the steam pipe leads to the engine; this consists of a small cylindrical vessel with flat ends tied together by a central stay. Short pipes connect the dome near each end with the steam space of the main shell.

The locomotive type of boiler has been successfully adapted to marine and many other uses by various inventors. This form gives much greater heating surface than others in proportion to its weight, and allows, especially when worked with forced draught, a large amount of power to be got from a small boiler. It is probable that, if any further rise is to occur in the steam pressure used in marine engines, comparable to that which has occurred during the last two or three years, the present normal marine boiler will give place to a form more nearly resembling the locomotive type.

The use of liquid fuel for boilers has of late acquired considerable importance. The petroleum refuse which is left after distilling paraffin from the crude oil forms an exceedingly cheap fuel, with a calorific value per pound about one-third greater than that of coal. It has now superseded coal in the steamers of the Caspian, and has been largely employed for locomotives in the southeastern part of Russia. It is largely used in the United States in stationary engines. The oil is injected in the form of spray near the foot of the fire box by a steam jet arranged in such a way that air will be drawn into the furnace along with the petroleum. In the arrangement for burning petroleum the flame impinges on a structure of fire brick, built in the fire box, with numerous openings to allow the products of combustion to diffuse themselves throughout the combustion chamber. This guards against too intense action on the metallic surfaces, and at the same time serves as a reservoir of heat to rekindle the flame if combustion is intermittent.

Governing.—To make an engine run steadily an almost continuous process of adjustment must go on, by which the amount of work done by the steam in the cylinder is adapted to the amount of external work demanded of the engine. Even in cases where the demand for work is sensibly uniform, fluctuations in boiler pressure still make regulation necessary. Generally the process of government aims at regularity of speed; occasionally, however, it is some other condition of running that is maintained constant, as when an engine driving a dynamo-electric machine is governed by an electric regulator to give a constant difference of potential between the brushes.

The ordinary methods of regulating are either (*a*) to alter the pressure at which steam is admitted by opening or closing more or less a throttle valve between the boiler and the engine, or (*b*) to alter the volume of steam admitted to the cylinder by varying the point of cut-off. The former plan was introduced by Watt and is still common, especially in small engines. From the point of view of heat economy it is wasteful, since the process of throttling is essentially irreversible, but this objection is to some extent lessened by the fact that the wire-drawing of steam dries or superheats it, and consequently reduces the condensation which it suffers on coming into contact with the chilled cylinder walls. On the other hand, to hasten the cut-off involves a gain rather than a loss of efficiency unless the ratio of expansion is already very great. The second plan of regulating is much to be preferred, especially when the engine is subject to large variations of load, and is very generally followed in stationary engines of the larger types.

In large stationary engines the most usual plan of automatically regulating the expansion is to employ some form of trip gear, the earliest type of which was introduced in 1849 by G. H. Corliss of Providence, R. I. In the Corliss system the valves which admit steam are distinct from the exhaust valves. The latter are opened and closed by a reciprocating piece, which takes its motion from an eccentric. The former are opened by a reciprocating piece, but are closed by springing back when released by a trip, or trigger action. The trip occurs earlier or later in the piston's stroke according to the position of the governor. The admission valve is opened by the reciprocating piece with equal rapidity whether the cut-off is going to be early or late. It remains wide open during the admission, and then, when the trip action comes into play, it closes suddenly. Generally the valves of Corliss engines are cylindrical plates turning in hollow cylindrical seats which extend across the width of the cylinder. Often, however, the admission valves are of the disk or double-beat type, and spring into their seats when the trip gear acts. Many forms of Corliss gear have been invented by Corliss himself and by others.

Stationary Engines.—In classifying engines with regard to their general arrangement of parts and mode of working, account has to be taken of a considerable number of independent characteristics. We have, first, a general division into *condensing* and *noncondensing engines*, with a subdivision of the condensing class into those which act by surface condensation and those which use injection. Next there is the division into *compound* and *noncompound*, with a further classification of the former as double, triple, or quadruple expansion engines. Again, engines may be classed as *single* or *double acting*, according as the steam acts on one or alternately on both sides of the piston. Again, a few engines—such as steam hammers and certain kinds of steam pumps—are *nonrotative*, that is to say, the reciprocating motion of the piston does work simply on a reciprocating piece; but generally an engine does work on a continuously revolving shaft, and is termed *rotative*. In most cases the crank pin of the revolving shaft is connected directly with the piston rod by a connecting rod, and the engine is then said to be *direct-acting;* in other cases, of which the ordinary beam engine is the most important example, a lever is interposed between the piston and the connecting rod. The same distinction applies to nonrotative pumping engines, in some of which the piston acts directly on the pump rod, while in others it acts through a beam. The position of the cylinder is another element of classification, giving *horizontal*, *vertical*, and *inclined cylinder* engines. Many vertical engines are further distinguished as belonging to the *inverted cylinder* class; that is to say, the cylinder is above the connecting rod and crank. In *oscillating cylinder engines* the connecting rod is dispensed with; the piston rod works on the crank pin, and the cylinder oscillates on trunnions to allow the piston rod to follow the crank pin round its circular path. In *trunk engines* the piston rod is dispensed with; the connecting rod extends as far as the piston, to which it is jointed, and a trunk or tubular extension of the piston, through the cylinder cover, gives room for the rod to oscillate. In *rotary* engines there is no piston in the ordinary sense; the steam does work on a revolving piece, and the necessity is thus avoided of afterward converting reciprocating into rotary motion.

In the single-acting atmospheric engine of Newcomen the beam was a necessary feature; the use of water packing for the piston required that the piston should move down in the working stroke, and a beam was needed to let the counterpoise pull the piston up. Watt's improvements made the beam no longer necessary; and in one of the forms he designed it was discarded—namely, in the form of pumping engine known as the Bull engine, in which a vertical inverted cylinder stands over and acts directly on the pump rod. But the beam type was generally retained by Watt, and for many years it remained a favorite with builders of engines of the larger class. The beam formed a convenient driver for pump rods and valve rods; and the parallel motion invented by Watt as a means of guiding the piston rod, which could easily be applied to a beam engine, was, in the early days of engine building, an easier thing to construct than the plane surfaces which are the natural guides of the piston rod in a direct-acting engine. In the United States the direct-acting type has almost entirely displaced the beam type. For mill driving and the general purposes of a rotative engine the beam type is now never chosen. In pumping engines it has been used, but even there the tendency is to use direct-acting forms.

No type of steam engine is so common as the horizontal Hori-direct-acting. We give the details of construction generally followed in this class of engine.

The cylinder consists of cast iron, exactly bored, of which the ports and sides of the valve chest form part. Sometimes there is an interior cylinder called a "liner," especially in large engines, and the space between the inner and outer cylinder is used as a steam jacket. In the front cylinder cover there is a stuffing box through which the piston rod passes. The stuffing box is kept steam-tight by a soft packing which is pressed in by a gland. In some instances the packing consists of metallic rings. The cylinder cover and gland are lined with a brass ring in the hole through which the piston rod passes. The valve rod is brought out of the valve chest in the same way. The piston is a hollow casting into which the piston rod is screwed and riveted over. It is packed by two split rings of cast iron, which are sprung into recesses turned in the circumference of the piston. This mode of packing is used in locomotives and small engines. For large pistons the usual plan is to employ wider split rings, called floating rings, pressed against the sides of the cylinder, not by their own elasticity, but by separate springs behind them in the body of the piston; they are held in place by a movable flange called a junk ring on one face of the piston. The crosshead consists of a steel centerpiece with a round boss, in which the piston rod is secured by a cotter, and a forked front, where the end of the connecting rod works on a pin. A pair of pins at top and bottom carry the steel shoes or sliding blocks, whose distance from the center is adjustable by nuts to take up wear. Occasionally the crank is omitted, and the connecting rod works on a pin fixed in a disk on the end of the shaft in front of the main bearing. The valve rod, which is worked by an eccentric just behind the bearing, is extended through the end of the valve chest, and forms the plunger of a feed pump which is bolted to the end of the chest. Frequently the feed pump is fixed at any convenient part of the bedplate, and is driven by a separate eccentric, and in some cases its plunger is connected directly to the crosshead. In the main bearing the shaft turns in gun metal or phosphor-bronze blocks called bearings. In heavy engines, these are generally lined with Babbitt's antifriction metal or other soft alloy, and in many modern engines the brasses are entirely dispensed with, a lining of Babbitt's metal being let into the cast-iron surface of the bearing. When the bearings are in two pieces, the plane of division between them is chosen to be that in which the wear is likely to be least. A more satisfactory adjustment is possible when the bearings are in three or more pieces.

In the large horizontal Corliss engine the cylinder is 34 inches in diameter, the stroke 8 feet, and the speed 45 revolutions per minute, giving a mean piston speed of 720 feet per minute. The cylinder is steam-jacketed round the barrel in the space between the liner and the outer cylinder, and also at the ends, which are cast hollow for this purpose. In large horizontal engines the weight of the piston tends to cause excessive wear on the lower side of the cylinder. In some of this type a part of the weight is borne by a tail rod, ending in a block, which slides on a fixed guide behind the cylinder. To further diminish wear the piston is sometimes made much wider from front to back than in the engine here described; and the device is sometimes resorted to of giving the piston rod "camber"—that is to say, an upward curvature in the middle portion, which the weight of the piston reduces to straightness. The condenser is placed in a well in front of the cylinder, and the air pump, which is a vertical bucket pump, is worked by a bell-crank lever, connected with the crosshead by a link. The fly wheel of this engine is grooved for rope-gearing; it is cast in segments, which are bolted to one another and to the spokes, and the spokes are secured by cotters in tapered sockets in the nave. It is large and heavy, to suit the inequality of driving effort which is caused by the use of a single cylinder and a very early cut-off in engines of this class. To facilitate starting and valve setting, mill engines are often provided with an auxiliary called a "barring" engine. The barring engine turns a toothed pinion, which gears into a toothed rim in the fly wheel, and is contrived to fall automatically out of gear as soon as the main engine starts.

When uniformity of driving effort or the absence of dead-points is specially important, two independent cylinders are often coupled to the same shaft by cranks at right angles to each other, an arrangement which allows the engine to be started readily from any position. The ordinary locomotive is an example of this form. Among fixed engines of the larger kind, *winding engines*, in which ease of starting, stopping, and reversing is essential, are very generally made by coupling a pair of horizontal cylinders, with cranks at right angles to each other, on opposite sides of the winding-drum, with the link-motion as the means of operating the valves.

In tandem engines, since the pistons move together, there is no need to provide a receiver between the cylinders. It is practicable to follow the "Woolf" plan of allowing the steam to expand directly from the small into the large cylinder; and in many instances this is done. In point of fact, however, the connecting pipe and steam chest form an intermediate receiver of considerable size, which will cause loss by "drop" unless steam be cut off in the large cylinder before the end of the stroke. Hence it is more usual to work with a moderately early cut-off in the low-pressure cylinder than to use the "Woolf" plan of admitting steam to it throughout the whole stroke. Unless it is desired to make the cut-off occur before half-stroke, a common slide valve will serve to distribute steam to the large cylinder. For an earlier cut-off than this a separate expansion valve is required on the low-pressure cylinder, to supplement the slide valve; and in any case, by providing a seperate expansion valve, the point of cut-off is made subject to easy control, and may be adjusted so as to avoid drop, or to divide the work as may be desired between the two cylinders. For this reason it is not unusual to find an expansion valve, as well as a common slide valve, on the low-pressure cylinder even of tandem engines. In many cases, however, the common slide valve only is used. On the high-pressure cylinder of compound engines, the cut-off is usually effected either by an expansion slide valve or by some form of Corliss or other trip-gear.

For mill engines the compound tandem and compound coupled types are now the most usual, and the high-pressure cylinder is very generally fitted with Corliss gear. In the compound coupled arrangement the cylinders are on separate bedplates, and the fly wheel is between the cranks.

The general arrangement of vertical engines differs little from that of horizontal engines. The cylinder is usually supported above the shaft by a cast-iron frame resembling an inverted A, whose sides are kept parallel for a part of their length to serve as guides for the crosshead. Sometimes one side of the frame only is used, and the engine is stiffened by a wrought-iron column between the cylinder and the base on the other side. *Wall engines* are a vertical form with a flat frame or bedplate, which is made to be bolted against a wall; in these the shaft is generally at the top. Vertical engines are compounded, like horizontal engines, either by coupling parallel cylinders to cranks at right angles (as in the ordinary marine form, which we describe later), or tandem fashion, by placing the high-pressure cylinder above the other. In vertical condensing engines the condenser is situated at the base, and the air pump, which has a vertical stroke, is generally worked by a lever connected by a short link to the crosshead. In some cases the pump is horizontal, and is worked by a crank on the main shaft.

Engines making 400 to 1600 revolutions per minute have been extensively applied, in recent years, to the driving of dynamos and other high-speed machines. These are for the most part single-acting; steam is admitted to the back of the piston only, and the connecting rod is in compression throughout the whole revolution. Besides simplifying the valves, this has the important advantage that alternation of strain at the joints may be entirely avoided, with the knocking and wear of the brasses which it is apt to cause. To secure, however, that the connecting rod shall always push, there must be much cushioning during the back or exhaust stroke. From a point near the middle of the back stroke to the end the piston is being retarded; and, as this must not be done by the rod (which would thereby be required to pull), cushioning must begin there, and the work spent upon the cushion must at every stage be at least as great as the loss of energy on the part of the piston and rod. In some single-acting engines this cushioning is done by compressing a portion of the exhaust steam; in others the rod is kept in compression by help of a supplementary piston, on which steam from the boiler presses; in Mr. Willans' engine the cushioning is done by compressing air.

In engines for pumping or for blowing air it is not essential to drive a revolving shaft, and in many forms the reciprocating motion of the steam piston is applied directly or through a beam to produce the reciprocating motion of the pump piston or plunger. On the other hand, pumping engines are frequently made rotative for the sake of adding a fly wheel. When the level of the suction water is sufficiently high, horizontal engines, with the pump behind the cylinder and in line with it, are generally preferred; in other cases a beam engine or vertical direct-acting engine is more common. Horizontal engines are, however, employed to pump water from any depth by using triangular rocking frames, which serve as bell crank levers between the horizontal piston and vertical pump rods.

From the earliest days of the rotative engine attempts have been made to avoid the intermittent reciprocating motion which an ordinary piston engine first produces and then converts into motion of rotation. Murdock, the contemporary of Watt, proposed an engine consisting of a pair of spur wheels gearing with one another in a chamber through which steam passed by being carried round the outer sides of the wheels in the spaces between successive teeth.

In a more modern wheel engine (Dudgeon's) the steam was admitted by ports in side-plate into the clearance space behind teeth in gear with one another, just after they had passed the line of centers. From that point to the end of the arc of contact the clearance space increased in volume; and it was therefore possible, by stopping the admission of steam at an intermediate point, to work expansively. The difficulty of maintaining steam-tight connection between the teeth and the side-plates on which the faces of the wheels slide is obvious; and the same difficulty has prevented the success of many other forms of rotary engine. These have been devised in immense variety, in many cases, it would seem, with the idea that a distinct mechanical advantage was to be secured by avoiding the reciprocating motion of a piston. In point of fact, however, very few forms entirely escape having pieces with reciprocating motion. In all rotary engines, with the exception of steam turbines—where work is done by the kinetic impulse of steam—there are steam chambers which alternately expand and contract in volume, and this action usually takes place through a more or less veiled reciprocation of working parts. So long as engines work at a moderate speed there is little advantage in avoiding reciprocation; the alternate starting and stopping of piston and piston rod does not affect materially the frictional efficiency, throws no deleterious strain on the joints, and need not disturb the equilibrium of the machine as a whole. The case is different when very high speeds are concerned; it is then desirable as far as possible to limit the amount of reciprocating motion and to reduce the masses that partake in it.

The early steamers were fitted with paddle wheels, and the engines used to drive them were for the most part modified beam engines. Bell's *Comet* was driven by a species of inverted beam engine, and another form of inverted beam, known as the side-lever engine, was for long a favorite with marine engineers. In the side-lever engine the cylinder was vertical, and the piston rod projected through the top. From a crosshead on the rod a pair of links, one on each side of the cylinder, led down to the ends of a pair of horizontal beams or levers below, which oscillated about a fixed gudgeon at or near the middle of their length. The two levers were joined at their other ends by a crosstail, from which a connecting rod was taken to the crank above. The side-lever engine is now obsolete.

In American practice, engines of the beam type, with braced beam supported on A frames above the deck, are still common in river steamers and coasters. They are unknown in the steamboat of western rivers.

An old form of direct-acting paddle engine was the steeple engine, in which the cylinder was set vertically below the crank. Two piston rods projected through the top of the cylinder, one on each side of the shaft and of the crank. They were united by a crosshead sliding in vertical guides, and from this a return connecting rod led to the crank.

Modern paddle wheel engines are usually of one of the following types. In *oscillating cylinder engines* the cylinders are set under the crank shaft, and the piston rods are directly connected to the cranks. The cylinders are supported on trunnions which give them the necessary freedom of oscillation to follow the movement of the crank. Steam is admitted through the trunnions to slide valves on the sides of the cylinders. In some instances the mean position of the cylinders is inclined instead of vertical; and oscillating engines have been arranged with one cylinder before and another behind the shaft, both pistons working on one crank. The oscillating cylinder type is best adapted for what would now be considered comparatively low pressures of steam. *Diagonal engines* are direct-acting engines of the ordinary connecting rod type, with the cylinders fixed on an inclined bed and the guides sloping up toward the shaft.

When the screw propeller began to take the place of paddle wheels in ocean steamers, the increased speed which it required was at first supplied by using spur-wheel gearing in conjunction with one of the forms of engines then usual in paddle steamers. After a time types of engine better suited to the screw were introduced, and were driven fast enough to be connected directly to the screw shaft. The smallness of the horizontal space on either side of the shaft formed an obstacle to the use of horizontal engines, but this difficulty was overcome in several ways. In Penn's trunk engine, still used in the navy, the engine is shortened by attaching the connecting rod directly to the piston, and using a hollow piston rod, called a trunk, large enough to allow the connecting rod to oscillate inside it. The trunk extends through both ends of the cylinder and forms a guide for the piston. It has the drawback of requiring very large stuffing boxes, of wasting cylinder space, and of presenting a large surface of metal to alternate heating by steam and cooling by contact with the atmosphere. The use of high-pressure steam has now made the trunk engine obsolete.

The return connecting rod engine is another horizontal form much used in the navy. It is a steeple engine placed horizontally, with two, and in some cases four, piston rods in each cylinder. The piston rods pass clear of the shaft and the crank, and are joined beyond it in a guided crosshead, from which a connecting rod returns.

Ordinary horizontal direct-acting engines with a short stroke and a short connecting rod are also common in war ships, where the horizontal is frequently preferred to the vertical type of engine, for the sake of keeping the machinery below the water line. In horizontal marine engines the air pump and condenser are generally placed on the opposite side of the shaft from the cylinder, which balances the weight and allows the air pump to be driven direct.

In merchant ocean steamers one general type of engine is universal, and the same type is now to an increasing extent adopted in naval practice. This is the inverted vertical direct-acting engine, generally with two or more cylinders placed side by side directly over the shaft. In exceptional cases a single cylinder has been used, with a fly wheel on the shaft. Two, three and four cylinders are common.

The ordinary locomotive consists of a pair of direct-acting horizontal or nearly horizontal engines, fixed on the rigid frame near the forward end of a boiler of the type heretofore described, and coupled to the drive wheels by cranks at right angles, each with a single slide valve worked by a link motion, or by a form of radial gear. The engine is noncondensing, except in special cases, and the exhaust steam, delivered at the base of the funnel through a blast pipe, serves to produce a draught of air through the furnace. In some instances a portion of the exhaust steam, amounting to about one-fifth of the whole, is diverted to heat the feed water. In tank engines the feed water is carried in tanks on the engine itself; in most cases it is carried behind in a tender.

There are usually two pairs of drive wheels, whose frictional adhesion to the rails furnishes the necessary tractive force. In rare instances a single pair of driving wheels are used; in many more a greater tractive force is secured by having two equal driving wheels on each side, connected by a coupling rod between pins on the outside of the wheels. In freight engines a still greater proportion of the whole weight is utilized to give tractive force by coupling three and even four wheels on each side. These arrangements are distinguished by the terms "four-coupled," "six-coupled," and "eight-coupled" applied to the engines. In *inside-cylinder* engines the cylinders are placed side by side within the frame of the engine, and their connecting rods work on cranks in the driving shaft. The American locomotive is never so constructed. In *ontside-cylinder* engines the cylinders are spread apart far enough to lie outside the frame of the engine. This dispenses with the cranked axle, which is the weakest part of a locomotive engine. Owing to the frequent alternation of strain to which it is subject, a locomotive crank axle is peculiarly liable to rupture, and has to be removed after a certain amount of use.

In obsolete engines the leading wheels were coupled to driving wheels behind them, but it is now generally preferred to have under the front of the engine two or four smaller wheels which do not form part of the driving system. These are carried in a small truck upon which the front end of the boiler rests on a swivel-pin or plate which allows the truck to turn, so as to adapt itself to curves in the line, and thus obviate the grinding of tires and danger of derailment which would be caused by using a long rigid wheel base. This form of truck is of American origin; it was brought into general use in America, and is now common in English as well as in American practice. Instead of a four wheeled truck, a single pair of leading wheels are also used, carried by a Bissel *pony* truck, which has a swing bolster pivoted by a radius bar about a point some distance behind the axis of the wheels. This has the advantage of combining lateral with radial movement of the wheels, both being required if the wheel base is to be properly accommodated to the curve. Another method of getting lateral and radial freedom is the plan used by Mr. Webb of carrying the leading axle in a box curved to the arc of a circle, and free to slide laterally for a short distance, under the control of springs, in curved guides.

In inside-cylinder engines the slide-valves are frequently placed back to back in a single valve chest between the cylinders. The width of the engine within the frame leaves little room for them there, and they are reduced to the flattest possible form, in some cases with split ports, half above and half below a partition in a central horizontal plane.

In a powerful locomotive of the ordinary type the cylinders are 17 to 19 inches in diameter, with a stroke of about 26 inches. The steam pressure is 130 to 175 pounds. The horse power ranges up to about 700. A passenger engine for express service has driving wheels from 7 to 8 feet in diameter, and weighs, without the tender, about 40 tons. Of this nearly 15 tons is borne by each driving axle.

The outside-cylinder type is adopted by several British makers; in America it is universal. Here the cylinders are in castings which are bolted together to form a saddle on which the bottom of the smoke box sits. The slide valves are on the tops of the cylinders, and are worked through rocking levers from an ordinary link motion. Other features by which American practice is distinguished are the use of bars instead of plates for the frames, of cast-iron wheels with chilled rims instead of wrought-iron wheels with steel rims shrunk or forced on and steel fire boxes and wrought-iron tubes instead of the English copper fire boxes and brass tubes.

Locomotive engines have been compounded in several ways. In 1876 M. A. Mallet introduced a type of compound locomotive in which one small high-pressure cylinder and one large low-pressure cylinder were used in place of the two equal cylinders of a common locomotive. Outside cylinders were used in the first instance, but Mallet's system is also applied to inside cylinder engines. The pipe from the high to the low-pressure cylinder takes a winding course through the smoke box; this gives a sufficient volume of intermediate receiver, and also dries the steam before it enters the large cylinder. A reducing valve is provided through which steam of a pressure lower than that of the boiler can be admitted direct to the low-pressure cylinder to facilitate starting. The reversing gear is arranged to act on both cylinders by one movement, and also to permit a separate adjustment of the cut-off in each. Engines on Mallet's system have been successfully used by some continental railways and in India, in some instances by conversion from the non-compound form. His plan has the advantage of permitting this (in certain cases), and of requiring scarcely any more working parts than are needed in a common locomotive; but it gives an unsymmetrical engine. He has also proposed an engine with four cylinders—one high-pressure cylinder tandem with one low-pressure cylinder on each side. Another symmetrical form has been used, in which a pair of outside high-pressure cylinders are compounded with a pair of inside low-pressure cylinders.

Experiments on the saving of fuel by compounding locomotives point to an economy of from 10 to 20 per cent.

Steam *road-locomotives* or traction engines have usually a boiler of the locomotive type, with a cylinder or compound pair of cylinders, generally on the top, driving a shaft from which motion is taken by a gearing chain or spur wheels to a single driving axle at the fire box end. The engine is steered by means of a leading axle, whose direction is controlled by a hand wheel and chain gear. To facilitate rapid turning the driving wheels are connected to their axle by a differential or compensating gear which allows them to revolve at different speeds. This is a set of four bevel wheels like White's dynamometer coupling—the outside bevel wheels are attached to the driving wheels; the intermediate ones, which gear with these, turn in bearings in a revolving wheel driven by the engine. So long as both driving wheels are equally resisted both are driven at the same speed, but if one is retarded (as the inner wheel is in turning a curve) it acts to some extent as a fulcrum to the bevel gear, and the outer wheel takes a greater share of the motion. An important feature in traction engines is the elasticity of the driving wheels. Many devices have been employed, partly to give the wheels an extended tread, or arc of contact with the ground, and partly to avoid shocks in passing over rough ground. Both objects are accomplished by Mr. R. W. Thomson's plan of surrounding each wheel with a thick tire of india rubber, protected on the outside by an armor of small plates. In most modern traction engines the rim is itself rigid, but is connected to the nave through a system of springs which allow it to take up an eccentric position, and the tires have skew bars on the surface to increase their adhesion to the road. These fixtures are not found necessary in this country.

Under the head of air and gas engines we may include all heat engines in which the working substance is air, or the gaseous products of the combustion of fuel and air, whether the fuel be itself solid, liquid, or gaseous. When air alone forms the working substance, it receives heat from an external furnace by conduction through the walls of a containing vessel, as the working substance in the steam engine takes in heat through the shell of the boiler. An engine supplied with heat in this way may be called an *external combustion* engine, to distinguish it from a very important class of engines in which the combustion which supplies heat occurs within a closed chamber containing the working substance. The ordinary coal gas explosive engine is the most common type of *internal-combustion* engine.

In 1866 Otto and Langen introduced a curious engine, which, as to economy of gas, was distinctly superior to its predecessors. Like them it did not use compression. The explosion occurred early in the stroke, in a vertical cylinder, under a piston which was free to rise without doing work on the engine shaft. The piston rose with great velocity, so that the expansion was much more nearly adiabatic than in earlier engines. Then after the piston had reached the top of its range the gases cooled, and their pressure fell below that of the atmosphere; the piston consequently came down, this time in gear with the shaft, and doing work. The burnt gases were discharged during the last part of the downstroke. A friction coupling allowed the piston to be automatically thrown out of gear when rising, and into gear when descending. This "atmospheric" gas engine used about forty cubic feet of gas per horse power per hour, and came into somewhat extensive use in spite of its noisy and spasmodic action. After a few years it was displaced by a greatly improved type.

Doctor Otto's "silent" engine, introduced in 1876, was the first successful motor of the modern type. It is a single-acting engine, generally horizontal in form, and the explosive mixture is compressed in the working cylinder itself. This is done by making the cycle of the action extend through two revolutions of the engine. During the first forward stroke gas and air are drawn in by the piston. During the first backstroke the mixture is compressed into a large clearance space at the end of the cylinder. The mixture is then ignited, and the second forward stroke (which is the only working stroke in the cycle) is performed under the pressure of the heated products of combustion. During the second backstroke the products are discharged, with the exception of so much as remains in the clearance space, which serves to dilute the explosive mixture in the next cycle.

Over 50,000 Otto engines are now in use, of power ranging up to about forty horse power. Besides the engines which have been named, others are manufactured in which the operations are essentially of the same kind, though in some cases the mechanical details are widely varied.

STEAM HAMMER. See HAMMER.

STEARINE, in commerce, designates a solid mixture of fatty acids (chiefly palmitic and stearic) which is being produced industrially from animal fats and used largely for the making of candles. In chemistry it is a generic term for the three "esters" derivable from glycerine, $C_3H_5(OH)_3$, by the replacement of one or more of the three (OH)'s by the residue $C_{18}H_{35}O_2$, which, in stearic acid, is combined with "H." Of these tristearine, $C_3H_5(C_{18}H_{35}O_2)_3$, is the most important; it occurs in animal fats only, largely in tallow. It crystallizes from ether in white pearly nodules, insoluble in cold but easily soluble in boiling alcohol. It can be distilled undecomposed *in vacuo*. On gradual exposure to higher temperatures it fuses at 55° C.; it then resolidifies, and then fuses again (permanently) at 71.5° (Heintz). The specific gravity of the liquid is 0.9245 at 65.5° C. (Duffy).

STEEL. See IRON.

STEELE, SIR RICHARD, one of the most active and prominent men of letters in the reign of Queen Anne, inseparably associated in the history of literature with his personal friend Addison.

The famous literary pair were born in the same year, 1672—Steele in Dublin, the senior by less than two months. Addison's reverend father took an interest in the warm-hearted young Irishman; but his influence did not steady him sufficiently to keep his impulses within the lines of a regular career; without waiting for a college degree he volunteered into the army, and served for some time as a cadet "under the command of the unfortunate duke of Ormonde." This escapade was made without his uncle's consent, and cost him, according to his own account, "the succession to a very good estate in the county of Wexford in Ireland." Still, he did not lack advancement in the profession he had chosen. His name was noted for promotion by King William, but the king's death took place before anything had been done for Captain Steele. He would seem to have remained in the army, though never on active service, for several years longer.

Steele probably owed the king's favor to honest admiration of the excellent principles of *The Christian Hero*, his first prose treatise, published in 1701. "It was now incumbent upon him," he says, "to enliven his character, for which reason he wrote the comedy called *The Funeral*." It was produced and published in 1701, was received on the stage with favor, and owing to its comparative purity helped, along with *The Christian Hero*, to commend its author to King William. In his next comedy, *The Lying Lover, or the Ladies' Friendship*, produced two years afterward, in 1703, Steele's moral purpose was directly avowed; and the play, according to his own statement, was "damned for its piety." *The Tender Husband*, produced eighteen months later (in April, 1705), though not less pure in tone, was more successful; in this play he gave unmistakable evidence of his happy genius for conceiving and embodying humorous types of character, putting on the stage the parents and grandparents of Squire Western, Tony Lumpkin, and Lydia Languish. It was seventeen years before Steele again tried his fortune on the stage with *The Conscious Lovers*, the best and most successful of his comedies, produced in 1722.

Meantime the gallant captain had turned aside to another kind of literary work, in which, with the assistance of his friend Addison, he obtained a more enduring reputation. The periodical was at that time taking the place of the pamphlet as an instrument for working on public opinion. *The Gazette* gave little opening for the play of Steele's lively pen, his main duty, as he says, having been to "keep the paper very innocent and very insipid;" but the position made him familiar with a new field of enterprise in which his inventive mind soon discerned materials for a project of his own. *The Tatler* made its first appearance on April 12, 1709. It was partly a newspaper, a journal of politics and society, published three times a week. Steele's position as gazetteer furnished him with special advantages for political news, and as a popular habitué of coffee-houses he was at no loss for social gossip. The assumed name of the editor was Isaac Bickerstaffe, but Addison discovered the real author in the sixth number, and began to contribute in the eighteenth. It is only fair to Steele to state that the success of *The Tatler* was established before Addison joined him, and that Addison contributed to only 42 of the 271 numbers that had appeared when the paper was stopped in January, 1711.

Only two months elapsed between the stoppage of *The Tatler* and the appearance of *The Spectator*, which was the organ of the two friends from March 1, 1711, till December 6, 1712. Addison was the chief contributor to the new venture, and the history of it belongs more to his life. Nevertheless, it is to be remarked as characteristic of the two writers that in this, as in *The Tatler*, Addison generally follows Steele's lead in the choice of subjects.

The Spectator was followed by *The Guardian*, the first number of which appeared on March 12, 1713. It had a much shorter career, extending to only 175 numbers, of which Steele wrote eighty-two and Addison fifty-three. *The Englishman* was started in January, 1714, immediately after the stoppage of *The Guardian*, to assail the policy of the Tory ministry. *The Lover*, started some six weeks later, was more general in its aims; but it gave place in a month or two to *The*

Reader, a direct counterblast to the Tory *Examiner*. *The Englishman* was resuscitated for another volume in 1715; and in the same year Steele projected in rapid succession three unsuccessful ventures—*Town Talk*, *The Tea Table*, and *Chit-Chat*. Three years later he started his most famous political paper, *The Plebeian*, rendered memorable by the fact that in it he had to contend against his old ally Addison. The subject of controversy between the two life-long friends was Sunderland's Peerage Bill. Steele's last venture in journalism was *The Theatre*, 1719–20, the immediate occasion of which was the revocation of his patent for Drury Lane. Besides these journals he wrote also several pamphlets on passing questions—on the disgrace of Marlborough in 1711, on the fortifications of Dunkirk in 1713, on the "crisis" in 1714, *An Apology for Himself and His Writings* (important biographically) in the same year, and on the South Sea mania in 1720.

The fortunes of Steele as a zealous Whig varied with the fortunes of his party. He lost his gazetteership when the Tories came into power in 1710. Over the Dunkirk question he waxed so hot that he threw up a pension and a commissionership of stamps, and went into parliament as member for Stockbridge to attack the ministry with voice and vote, as well as with pen. But he had not sat many weeks when he was expelled from the House for the language of his pamphlet on *The Crisis*, which was stigmatized as seditious. The *Apology*, already mentioned, was his vindication of himself on this occasion. With the accession of the house of Hanover his fortunes changed. Honors and substantial rewards were showered upon him. He was made a justice of the peace, deputy-lieutenant of Middlesex, surveyor of the royal stables, governor of the royal company of comedians—the last a lucrative post, and was also knighted (1715). He spent his last years on his wife's estate of Llangunnor in Wales, and, his health broken down by a paralytic seizure, died September 1, 1729.

STEELYARD, MERCHANTS OF THE, were Hanse merchants who settled in London in 1250 at the steelyard on the river side, near Cosin Lane, now Iron Bridge Wharf. Henry III. in 1259, at the request of his brother Richard, earl of Cornwall, conferred on them important privileges, which were renewed and confirmed by Edward I. It was chiefly through their enterprise that the early trade of London was developed and they continued to flourish till, on the complaint of the Merchant Adventurers in the reign of Edward VI., they were deprived of their privileges.

STEEN, JAN HAVICKSZ, German subject-painter, was born at Leyden in 1626, the son of a brewer of the place. He died at Leyden in 1679.

STEFFANI, AGOSTINO, ecclesiastic, diplomatist, and musical composer, was born at Castelfranco in 1655. In 1674 he published his first work, *Psalmodia Vespertina*, a part of which was reprinted in Martini's *Saggio di Contrappunto* in 1674. Of his first opera, *Marco Aurelio*, produced at Munich in 1681, the only copy known to exist is a MS. score preserved in the royal library at Buckingham palace. It was followed by *Solone* in 1685, *Servio Tullio* in 1686, *Alarico* in 1687, and *Niobe* in 1688. He inaugurated a long series of triumphs in Hanover by composing, for the opening of the new opera house in 1689, an opera called *Enrico il Leone*, which was produced with extraordinary splendor and achieved an immense reputation. For the same theater he composed *La Lotta d'Ercole con Achilleo* in 1689, *La Superbia d'Alessandro* in 1690, *Orlando Generoso* in 1691, *Le Rivali Concordi* in 1692, *La Libertà Contenta* in 1693, *I Trionfi del Fato* and *I Baccanali* in 1695, and *Briseide* in 1696. The libretto of *Briseide* is by Palmieri.

In 1724 the Academy of Antient Musick in London elected him its honorary president for life. Steffani died in 1730.

STEIBELT, DANIEL, pianist and composer, was was born between the years 1755 and 1765 at Berlin. In 1796 Steibelt removed to London, where his pianoforte playing attracted an amount of attention. In 1808 he was invited by the emperor Alexander to St. Petersburg, and there he resided, in the enjoyment of a lucrative appointment, until his death on September 20, 1823.

STEIN, HEINRICH FRIEDRICH KARL, BARON VOM UND ZUM, one of the greatest of German statesmen, and perhaps the most influential forerunner of Bismarck in the creation of German unity, was born at Nassau on October 26, 1757.

From 1773 to 1777 Stein studied political economy, jurisprudence, and history at the university of Göttingen.

In 1804 Stein was created a minister of state, with the portfolio of excise, customs, manufactures, and trade. In this capacity he abolished the internal customs duties throughout Prussia, and effected several other needed reforms; but he was unable to modify the general disastrous tenor of the Prussian policy, which was now ripening for the catastrophe of Jena. When the king, however, found himself left in the lurch by his ally Russia, at the peace of Tilsit (July 9, 1807), he turned in despair to the strong and candid counselor he had dismissed half a year before, and invited Stein to reënter his service, practically on his own terms.

Stein's momentous ministry did not last much more than a year. Napoleon soon awoke to the eminently patriotic and energetic character of the man, and an intercepted letter gave him the opportunity to demand Stein's dismissal. Frederick William had no option but to comply, as he shrank from the only possible alternative of an open breach with the French emperor. Stein was proscribed by Napoleon, his property in Westphalia was confiscated, and he himself had to take refuge in Austria from the French troops.

In 1812 the czar Alexander invited Stein to St. Petersburg, where he filled the post of unofficial adviser to his imperial majesty on German or rather on anti-Napoleonic affairs; and it would perhaps be difficult to overestimate the influence of the proximity of such a man in keeping Alexander's courage screwed to the sticking point. When the scene of the campaign of 1812 was transferred to Germany, Stein was intrusted with the administration of the Prussian districts occupied by the Russian troops, and he shares with Yorck the merit of arousing East Prussia to take arms against the French, and so of calling the "Landwehr" into existence for the first time. To Stein also mainly belongs the credit of effecting that union of Russia and Prussia (treaty of Kalisch, February 27, 1813) which was perhaps the main factor in the overthrow of Napoleon. In 1819 he founded the society for the publication of the *Monumenta Germaniæ Historica*, which has since done such admirable work. He died on June 29, 1831.

STEINAMANGER (Hung., *Szombathely;* Lat., *Sabaria*), the chief town of the trans-Danubian county of Vas, Hungary, is an old place of some interest. Though it has only 12,000 inhabitants, it is the seat of a Roman Catholic bishop, and has a Dominican convent, a seminary, a gymnasium, chamber of advocates, large orphanage, fine theater, and a number of superior government offices.

STEINER, JAKOB, one of the greatest geometricians of all ages, was born on March 18, 1796, at the Swiss village of Utzendorf (canton Bern).

Steiner's mathematical work was confined to geometry. This he treated synthetically, to the total exclusion of analysis, which he hated, and he is said to have considered it a disgrace to synthetical geometry if equal or higher results were obtained by analytical methods. In his own field he surpassed all his contemporaries. His investigations are distinguished by their great generality, by the fertility of his resources, and by a rigor in his proofs which rivals that of the ancients, so that he has been considered the greatest geometrical genius since the time of Apollonius. He died in 1863.

STENDAL, a manufacturing town and important railway junction in Prussian Saxony, and the former capital of the Altmark, is picturesquely situated on the Uchte, thirty-three miles to the northeast of Magdeburg. The population in 1885 was 16,186.

STENOGRAPHY. See Shorthand.

STEPHANUS BYZANTIUS, the author of a geographical dictionary entitled *'Εθνικά*, of which, apart from some fragments, we possess only the beggarly epitome of one Hermolaus. This work was first edited under the title *Περὶ πόλεων* (Aldus, Venice, 1502). Even in the imperfect form in which we have it the book is of great value from the references to ancient writers which it preserves.

STEPHEN, St., described in late MSS. of Acts xxii. 20, and in subsequent ecclesiastical tradition as *πρωτόμαρτυς*, was one of the first seven deacons who were chosen by the church in Jerusalem at the instance of the apostles. He is spoken of as "a man full of faith and the Holy Spirit," and, though his official function was rather the "serving of tables" than the ministry of the Word, the narrative of the book of the Acts shows him to have been principally and preëminently a preacher. After a brief period of popularity he was accused before the sanhedrin as a blasphemer, and, without being allowed to finish his speech in his own defense, he was hurried without the city walls and stoned to death, (*c.* 37 A.D.)

STEPHEN I., bishop of Rome from about 254 to 257, followed Lucius I. He withdrew from church fellowship with Cyprian and certain Asiatic bishops on account of their views as to the necessity of rebaptizing heretics. He is also mentioned as having insisted on the restoration of the bishops of Leon and Astorga, who had been deposed for unfaithfulness during persecution but afterward had repented. He is commemorated on August 2. His successor was Sixtus II.

STEPHEN II., pope from March, 762, to April, 757, was in deacon's orders when chosen to the vacant see within twelve days after the death of Zacharias. The main difficulty of his pontificate was in connection with the aggressive attitude of Aistulf, king of the Lombards. The death of Stephen took place not long after that of Aistulf. He was succeeded by Paul I.

STEPHEN III., pope from August 1, 768, to January 24, 772, was a native of Sicily, and, having come to Rome during the pontificate of Gregory III., gradually rose to high office in the service of successive popes. On the deposition of Constantine II., Stephen was chosen to succeed him. He was succeeded by Adrian I.

STEPHEN IV., pope from June, 816, to January, 817, succeeded Leo III., whose policy he continued. His successor was Paschal I.

STEPHEN V., pope from 885 to 891, succeeded Adrian III., and was in turn succeeded by Formosus.

STEPHEN VI., pope from May, 896, to July–August, 897, succeeded Boniface VI., and was in turn followed by Romanus.

STEPHEN VII. (February, 929, to March, 931) and STEPHEN VIII. (July, 939, to October, 942) were virtually nonentities, who held the pontificate during the so-called "pornocracy" of Theodora and Marozia.

STEPHEN IX., pope from August, 1057, to March, 1058, succeeded Victor II. (Gebhard of Eichstädt). He showed great zeal in enforcing the Hildebrandine policy as to clerical celibacy, and was planning large schemes for the expulsion of the Normans from Italy, and the elevation of his brother to the imperial throne, when he was seized by a severe illness, from which he only partially and temporarily recovered. He died at Florence March 29, 1058, and was succeeded by Benedict X.

STEPHEN, king of England, the second son of Stephen, earl of Blois, and Adela, daughter of William the Conqueror, was born at Blois in 1105. He obtained the county of Mortain by the gift of his uncle, Henry I., and that of Boulogne by marriage with Maud, daughter of Count Eustace. As one of the chief barons of Normandy he had sworn to aid in securing the succession to the crown of England for his cousin, the empress Matilda, and her infant son, afterward Henry II. Nevertheless, on the death of Henry I. in 1135, Stephen at once crossed over to England, and was welcomed by the citizens of London as king. He died on October 25, 1154. A brave man, a good soldier, merciful and generous, but devoid of moral strength and political insight, he was utterly incapable to discharge a task which demanded all the skill and energy of his great successor. His nominal reign was a period of anarchy in English history, important only as a full justification for the tyrannies of Henry I. and Henry II.

STEPHEN, Sir James, English historian, was born in London January 3, 1789. In 1849 he was appointed regius professor of modern history in the university of Cambridge. He was also the author of *Lectures on the History of France*, 1851, and *Desultory and Systematic Reading*, a lecture, 1853. He died at Coblentz on September 15, 1859.

STEPHENS, the incorrect English form of the name of *Estienne*, the distinguished French family of scholars and printers.

The founder of the race was Henri Estienne (d. 1520), the scion of a noble family of Provence, who came to Paris in 1502, and soon afterward set up a printing establishment at the top of the Rue St. Jean de Beauvais, on the hill of Sainte-Geneviève opposite the law school. He died in 1520, and his three sons being minors, the business was carried on by his foreman, Simon de Colines, who in 1521 married his widow.

Robert Estienne was Henri's second son. After his father's death he acted as assistant to his stepfather, and in this capacity superintended the printing of a Latin edition of the New Testament in 16mo (1523). He was an author of no mean pretensions. At Geneva, whither he had gone from Paris on account of theological disputes, Robert proved himself an ardent partisan of Calvin, several of whose works he published. He died there September 7, 1559.

Charles Estienne, the third son of Henri, born in 1504 or 1505, was, like his brother Robert, a man of considerable learning. He died in 1564, according to some accounts in prison, having been thrown there for debt.

Henri Estienne, sometimes called "Henri II.," was the eldest son of Robert, and was born in 1528. Few men have ever served the cause of learning more devotedly. For over thirty years the amount which he produced, whether as printer, editor, or original writer, was enormous. The productions of his press, though printed with the same beautiful type as his father's books, are, owing to the poorness of the paper and ink, inferior to them in general beauty. The best, perhaps, from a typographical point of view, are the *Poetæ Græci Principes*, the *Plutarch*, and the *Plato*. It was rather Henri Estienne's scholarship which gave value to his editions. He was not only his own press-corrector but his own editor. He died at Lyons in 1598.

STEPHENS, Alexander Hamilton, American statesman, was born in Georgia, February 11, 1812. In spite of many difficulties imposed by poverty and ill-health, he became a lawyer and politician of great reputation and popularity. He was one of the Whig leaders of his State until about 1850, and then drifted into the Democratic party through the rising discussions of slavery, serving in Congress from 1843 until 1859. In 1860 he opposed secession warmly; but when his State had seceded he "followed his State," and was elected vice-president of the Confederate States. Whatever there was of opposition to the despotic tendencies of Jefferson Davis gathered around Stephens as a center; and the vice-president was never an influential member of the Confederate administration. His popularity in Georgia was unbounded, and he was elected representative in Congress in 1877–82, and governor, 1882–83, dying in office. In person he was small and extremely emaciated, seldom weighing more than ninety pounds, and always in delicate health; but his powers as an orator were remarkable.

STEPHENS, John Lloyd, traveler, was born November 28, 1805, at Shrewsbury, N. J. In 1834, the state of his health rendering it advisable that he should travel, he visited Europe, and for two years made a tour through many countries of that continent, extending his travels to Egypt and Syria. On his return to New York he published (under the name of "George" Stephens) in 1837 *Incidents of Travel in Egypt, Arabia Petræa, and the Holy Land.* This work was followed next year by the publication, also in two volumes, of *Incidents of Travel in Greece, Turkey, Russia, and Poland.* In 1839 Stephens arranged with Frederick Catherwood of London, who had accompanied him on some of his travels, and illustrated the above mentioned publications, that they should make an exploration together in Central America. The joint travels of Stephens and F. Catherwood occupied some eight months in 1839 and 1840. As the result of these researches Stephens published in 1841 *Incidents of Travels in Central America, Chiapas, and Yucatan.* In the autumn of 1841 the two travelers made a second exploration of Yucatan, the fruits of which were gathered up in a work published by Stephens in 1843, —*Incidents of Travel in Yucatan.* His health was entirely undermined by his long and incautious exposure to the deadly climate of Central America, and he died at New York October 10, 1852.

STEPHENSON, George, perfecter of the locomotive, was the son of Robert Stephenson, fireman of a colliery engine at Wylam, near Newcastle, where he was born June 9, 1781. In boyhood he was employed as a cowherd, and occupied his leisure in erecting clay engines and similar mechanical amusements. He set himself diligently to qualify himself for higher duties, and in his seventeenth year was appointed engineman or plugman. In 1801 he obtained the situation of brakesman, and in 1812 was appointed enginewright at Killingworth high pit at a salary of $500 a year. Having obtained permission from Lord Ravensworth, the principal partner of the Killingworth colliery, to incur the outlay for constructing a "traveling engine" for the tramroads between the colliery and the shipping port nine miles distant, he made a successful trial with the engine, which he named "My Lord," July 25, 1814. Setting himself diligently to improve his invention, he thoroughly satisfied himself that for the proper success of the locomotive a railway as nearly as possible level was an essential condition. In 1822 he succeeded in impressing with the importance of his invention the projectors of the Stockton and Darlington railway, who had contemplated using horses for their wagons, and was appointed engineer of the railway, with liberty to carry out his own plans, the result being the opening, September 27, 1825, of the first railway over which passengers and goods were carried by a locomotive. The success of the Stockton and Darlington railway led to the employment of Stephenson in the construction of the Liverpool and Manchester railway, which, notwithstanding prognostications of failure by the most eminent engineers of the day, he carried successfully through Chat Moss. He also succeeded in persuading the directors to give the locomotive a trial, and, as his improved invention, the "Rocket," during her trial trip made twenty-nine miles an hour, his suggestion met with complete approval; with the opening of the line, September 15, 1830, the modern era of railways may be said to have been definitely inaugurated. He died August 12, 1848.

STEPHENSON, Robert, engineer, son of the preceding by his first wife Fanny Henderson, was born at Willington Quay, October 16, 1803. His services were in great request as a railway engineer, and after the retirement of his father he was regarded as the chief authority on the subject. In this connection his most remarkable achievements were his railway viaducts on the tubular system, constructed with the aid of the practical knowledge of Sir William Fairbairn, and justly characterized as "the greatest discovery in construction in our day." Among his more notable bridges are the Royal Border bridge at Berwick-on-Tweed, the high-level bridge at Newcastle-on-Tyne, the Britannia tubular bridge over the Menai Straits, the Conway tubular bridge, and the Victoria tubular bridge over the St. Lawrence, Canada. In 1847 he entered the House of Commons as member for Whitby. In 1855 he was elected president of the Institute of Civil Engineers. He died October 12, 1859, and was buried in Westminster Abbey.

STEREOCHROMY. A process of painting.

STEREOSCOPE is an optical instrument for representing in apparent relief and solidity all natural objects by uniting into one image two representations of these objects as seen by each eye separately. This instrument owes its origin entirely to the experimental researches of Sir Charles Wheatstone on binocular vision, and the following passage from Mayo's *Outlines of Human Physiology*, p. 288, published in 1833, is the first clear enunication of the principle on which it is constructed:—"A solid object, being so placed as to be regarded by both eyes, projects a different perspective figure on each retina; now if these two perspectives be actually copied on paper, and presented one to each eye, so as to fall on corresponding parts, the original solid figure will be apparently reproduced in such a manner that no effort of the imagination can make it appear as a representation on a plane surface." The subject was taken up by Sir David Brewster, and was developed more particularly in two papers read to the Royal Society of Edinburgh in January, 1843, and April, 1844. These researches led Brewster to the invention of the lenticular or refracting stereoscope. For many years the refracting stereoscope of Brewster was one of the most popular of scientific instruments, and was to be found, along with an appropriate collection of pictures, in every drawing-room, but of late years it has somewhat fallen into the background, and the manufacture by photographers of stereoscopic views now forms but a small portion of their work. While much credit is due to Brewster for his writings on binocular vision, and for the efforts he made to introduce the stereoscope to the public, there is no doubt that Wheatstone was the real inventor of the instrument.

STEREOTYPE. See TYPOGRAPHY.

STERLING, the leading city of Whiteside county, Ill., is picturesquely situated on the north bank of Rock river, one of the most romantic and beautiful streams in the Northwest. It is also on the Chicago and North-Western railroad, 109 miles west of Chicago, and on the Davenport branch of the Chicago, Burlington and Quincy road, 52 miles from Rock Island and 30 miles east of Clinton, Iowa. The river at this point not only passes through scenery the most diversified and charming, but furnishes an invaluable water power to many of the leading manufacturing establishments operated at Sterling and vicinity. The country for a very considerable distance about Sterling is among the most fertile and productive in Illinois, and the annual crops, which are correspondingly large, find their market in the city, making it a leading receiving and shipping point, as also a financial and commercial center of local importance. Three banks, one private and two national, are maintained in the city, and a number of publications are regularly issued, embracing one daily and three weeklies in addition to one monthly magazine. There are fourteen churches, two opera houses, a high school, a public school building, the cost of which approximated $100,000, a number of fine hotels and stores, and many other public and private edifices. The manufacturing enterprises include agricultural implements, pumps, coal mining drills, burial cases and caskets, clocks and watches, butter coloring, high wines, beer, soap, castings, hardware novelties, butter tubs and barrels, machinery, paper, cigars, etc., etc., representing large investments and producing an annually increased output. The population of the city was 5,087 in 1880, and 5,822 in 1890.

STERLING, JOHN, author, was descended from a family of Scottish origin which had settled at Kames Castle in Bute, where John, the second son, was born July 20, 1806. He published in 1833 *Arthur Coningsby*, a novel, which attracted little attention, and his *Poems* (1839), the *Election, a Poem* (1841), and *Strafford*, a tragedy, were not more successful. He had, however, established a connection with *Blackwood's Magazine*, to which he contributed a variety of papers and several tales, which gave promise that under more favorable conditions he might have achieved greatness. He died at Ventnor, September 18, 1844.

STERNBERG, a manufacturing town in Moravia, Austria, is situated nine miles to the north of Olmütz and forty-seven miles to the northeast of Brünn. It is the chief seat of the Moravian cotton industry, and it also carries on the manufacture of linen, stockings, liqueurs, sugar, and bricks. The population in 1880 was 14,243.

STERNE, LAURENCE, one of the greatest of English humorists, was the son of an English officer, and great-grandson of an archbishop of York. Nearly all our information about the first forty-six years of his life before he became famous as the author of *Tristram Shandy* is derived from a short memoir jotted down by himself for the use of his daughter. It gives nothing but the barest facts, excepting three anecdotes about his infancy, his school-days, and his marriage. The date of his birth coincides with the close of the Marlborough wars. He was born at Clonmel, Ireland, on November 24, 1713, a few days after the arrival of his father's regiment from Dunkirk. His great-grandfather the archbishop had been master of Jesus College, Cambridge, and to Jesus College he was sent in 1732. He was admitted to a sizarship in July, 1733, and took his B.A. degree in 1736. One of his uncles was a prominent church dignitary in Yorkshire. Young Sterne took orders, and through his influence obtained in 1738 the living of Sutton, some eight miles north of York. On his marriage three years afterward he was presented to the neighboring living of Stillington, and did duty at both places. He was also a prebendary of York.

Sutton was Sterne's residence for twenty uneventful years—years at least concerning which his biography is silent. The only ascertained fact of consequence is that he kept up an intimacy which had begun at Cambridge with John Hall Stevenson, a witty and accomplished epicurean, owner of Skelton Castle in the Cleveland district of Yorkshire. Skelton Castle is nearly forty miles from Sutton, but Sterne, in spite of his double duties, seems to have been a frequent visitor there, and to have found in his not too strait-laced friend a highly congenial companion. Stevenson's various occasional sallies in verse and prose—his *Fables for Grown Gentlemen*, his *Crazy Tales*, and his numerous skits at the political opponents of Wilkes, among whose "macaronies" he numbered himself—were collected afer his death, and it is impossible to read them without being struck with their close family resemblance in spirit and turn of thought to Sterne's work, inferior as they are in literary genius. Without Stevenson Sterne would probably have been a more decorous parish priest, but he would probably never have written *Tristram Shandy* or left any other memorial of his singular genius. The two friends began to publish late in life and in the same year. The first two volumes of *Tristram Shandy* were issued on January 1, 1760, and at once made a sensation. York was scandalized at its clergyman's indecency and indignant at his caricature of a local physician; London was charmed with his audacity, wit, and graphic unconventional power. He went to London early in the year to enjoy his triumph, and found himself at once a personage in society—was called upon and invited out by lion-hunters, was taken to Windsor by Lord Rockingham, and had the honor of supping with the duke of York.

The ninth and last and shortest volume of *Tristram*, concluding the episode of "Toby Shandy's" amours, appeared in 1767. This dispatched, Sterne turned to a new project, which had probably been suggested by the ease and freedom with which he had moved through the traveling volume in *Tristram*. The *Sentimental Journey through France and Italy* was intended to be a long work: the plan admitted of any length that the author chose, but, after seeing the first two volumes through the press in the early months of 1768, Sterne's strength failed him, and he died in his London lodgings on March 18th, three weeks after the publication.

STESICHORUS of Himera, a very famous lyric poet, lived between 630 and 550 B.C. His name was originally Tisias, if we may trust Suidas, but it was changed to Stesichorus on account of his eminence in choral poetry. He was famed in antiquity for the richness and splendor of his imagination and his style, although Quintilian censures his redundancy and Hermogenes remarks on the excessive sweetness that results from his abundant use of epithets.

STETHOSCOPE. See AUSCULTATION.

STETTIN, the chief town of Pomerania, and the leading seaport in Prussia, is situated on the Oder, seventeen miles to the south of the Stettiner Haff and thirty miles from the Baltic Sea. In 1885 the population was 99,475; in 1890 it was 91,756, of whom 85,727 were Protestants, 3,112 Roman Catholics, and 2,388 Jews.

STEUART, SIR JAMES DENHAM, BART., author of *An Inquiry into the Principles of Political Econ-*

omy, was the only son of Sir James Steuart, solicitor-general for Scotland under Queen Anne and George I., and was born at Edinburgh on October 21, 1712. He died at his family seat, Coltness, in Lanarkshire, on November 26, 1780.

STEUBENVILLE, the capital of Jefferson County, Ohio, and one of the oldest and most widely known cities of the State, is situated on the west bank of the Ohio river, sixty-seven miles south of Pittsburgh. The Cleveland and Pittsburgh, and Pittsburgh, Cincinnati and St. Louis railroads pass through the city, the latter crossing the river on a handsome iron bridge; and, with the transportation facilities afforded by river steamers, not only render Steubenville easily accessible from all directions but a leading and important shipping point for the surrounding country. The city occupies an elevation distinguishable at a great distance, and contains one national and four private banks, two daily and two weekly papers, court-house and county buildings, fifteen churches, the Steubenville Female Seminary, a high school and academy, grain, paper and woolen mills, tin, copper and sheet-iron works, rubber paint works, manufactories of engines and machinery, fire-clay, bottles and glassware, pottery, lumber, sash, doors and blinds, with the general run of industrial enterprises carried on at all manufacturing centers. Among the features of this department of prominence in Steubenville are the shops of the Pittsburgh, Cincinnati and St. Louis railroad, and the works of the Jefferson Iron Company, at which a force of 500 men are steadily employed. Rich mines of bituminous coal are operated in the vicinity of the city, and natural gas is in general use for illuminating, domestic and manufacturing purposes, inducements for the location of enterprises that are not neglected. The population 12,093 in 1880, is at present (1890) 13,394.

STEVENS, Alfred. See Sculpture.

STEVENS, Thaddeus, was born at Peacham, Vt., April 4, 1792, graduated at Dartmouth College in 1814, and then settled in Pennsylvania. He soon became a leading lawyer of Lancaster, Penn., so far interested in politics as to be elected by the Whig party to the State legislature for several terms, and to the Federal house of representatives, 1849–63. When the mass of the Northern Whig party went into the new Republican party he went with it, and returned to Washington as a Republican representative in 1859, just before the outbreak of the Civil War. This position he retained until his death, just outlasting the Civil War and reconstruction. During this period of American history he was one of the leading characters. The methods on which he proposed to conduct the war were always drastic: the wholesale confiscation of lands in the seceding States, the disfranchisement of insurgent citizens, the emancipation and enfranchisement of the negroes, all found in him their earliest and warmest advocate. This was too radical even for the war party; but at the end of the war, Stevens' pronounced ability gave him the leadership of the house committee on reconstruction. Even in this position he never obtained a formal indorsement of his theory; but the practical management of reconstruction shows its strong influence in many features otherwise inexplicable. He lived to take a leading part in the unsuccessful impeachment of President Johnson, and to see the admission of the first installment of reconstructed States, and died at Washington, August 11, 1868.

STEVENS POINT, the county seat of Portage county, Wis., is situated on the east bank of the Wisconsin, and is an important depot of supplies and shipment for a lumber territory extended and productive. The Wisconsin Central and a branch of the Green Bay, Winona and St. Paul railroads connect Stevens Point with Menasha, Green Bay and Portage City, Wis., as also with trunk lines to all parts of the United States. The leading industry of the inhabitants is connected with lumber interests, as vast forests of pine and hardwoods in the vicinity give employment annually to large forces of loggers, the product of whose labor is transported to Stevens Point for manufacture and distribution. The city is supplied with three weekly papers, and two banks are required to adequately dispose of the volume of business. It also contains seven churches, a union school, an academy under the direction of the Roman Catholic Church, a number of hotels, stores, public halls, etc. The manufacturing establishments are made up of saw mills, flour mills, sash, door and blind factories, foundries and machine shops, and other enterprises devoted to the lumber industry. The population in 1890 was 7,888.

STEVENSON, Robert, Scotch civil engineer, was the only son of Alan Stevenson, partner in a West Indian house in Glasgow, and was born in that city June 8, 1772. Having lost his father in infancy, he removed with his mother to Edinburgh. In his youth he assisted his stepfather, Thomas Smith, in his lighthouse schemes, and at the early age of nineteen he was sent to superintend the erection of a lighthouse on the island of Little Cumbrae. In his general practice as a civil engineer he was employed in the construction of many county roads, in various important improvements in connection with the approaches to Edinburgh. It was chiefly through his interposition that an Admiralty survey was established, from which the Admiralty sailing directions for the coasts of Great Britain and Ireland have been prepared. Stevenson was elected a fellow of the Royal Society of Edinburgh in 1815, and afterward became a member of the Geological and Astronomical Societies of London and the Wernerian and Antiquarian Societies of Scotland. He published an account of the Bell Rock lighthouse in 1824, and, besides contributing important articles on engineering subjects to Brewster's *Edinburgh Encyclopædia* and the *Encyclopædia Britannica*, was the author of various papers read before the societies he was connected with. He died at Edinburgh July 12, 1850.

STEVINUS, Simon. This great mathematician was born in 1548 at Bruges (where the Place Simon Stevin contains his statue by Eugen Simonis) and died in 1620 at The Hague or in Leyden. Of the circumstances of his life very little is recorded; the exact day of his birth and the day and place of his death are alike uncertain.

His contemporaries were much struck by his invention of a carriage with sails, a little model of which was preserved at Scheveningen till 1802. The carriage itself had been lost long before; but we know that about the year 1600 Stevinus, with Prince Maurice of Orange and twenty-six others, made use of it on the seashore between Scheveningen and Petten, that it was propelled solely by the force of the wind, and that it acquired a speed which exceeded that of horses. Another idea of Stevinus, for which even Grotius gave him great credit, was his notion of a bygone age of wisdom. Mankind once knew everything knowable, but gradually forgot most of it, till a time came when little by little the forgotten knowledge was reacquired; the goal to be aimed at is the bringing about of a second age of wisdom, in which mankind shall have recovered all its early knowledge. The fellow-countrymen of Stevinus were proud that he wrote in their own dialect, which he thought fitted for a universal language, as no other abounded like Dutch in monosyllabic radical words.

History has been much less enthusiastic than his contemporaries in admiring these claims to fame, but it has discovered in Stevinus' works various inventions which did not at once receive the notice they deserved. He was the first to show how to fashion regular and semiregular polyhedra by delineating their frames in a plane. Stevinus also distinguished stable from unstable equilibrium. He proved the law of the equilibrium on an inclined plane. He demonstrated before Varignon the resolution of forces, which, simple consequence of the law of their composition though it is, had not been previously remarked. He discovered the hydrostatic paradox that the downward pressure of a liquid is independent of the shape of the vessel, and depends only on its height and base. He also gave the measure of the pressure on any given portion of the side of a vessel. He had the idea of explaining the tides by the attraction of the moon. He also wrote excellent treatises on military science, bookkeeping and the connection between decimal fractions and algebra.

STEWART, or STUART. For the royal house of this name, see STUART.

STEWART, DUGALD, one of the most influential of the Scottish philosophers, was born at Edinburgh on November 22, 1753. Dugald Stewart was educated at the high school and university of his native town. He also attended the Snell classes at Glasgow. After no more than a single session in Glasgow, Dugald Stewart was summoned by his father, whose health was beginning to fail, to conduct the mathematical classes in the university of Edinburgh. Though only nineteen years of age he discharged his duties with marked ability and success; and after acting three years as his father's substitute he was elected professor of mathematics in conjunction with him in 1775.

In 1792 he published the first volume of the *Elements of the Philosophy of the Human Mind;* the second volume appeared in 1814, and the third not till 1827. In 1793 he printed a text-book, *Outlines of Moral Philosophy*, which went through many editions; and in the same year he read before the Royal Society of Edinburgh his account of the *Life and Writings of Adam Smith.* Similar memoirs of Robertson the historian and of Reid were afterward read before the same body and appear in his published works. In 1810 appeared *Philosophical Essays*, in 1814 the second volume of the *Elements*, in 1815 the first part and in 1821 the second part of the "Dissertation" written for the *Encyclopædia Britannica* "Supplement," entitled "A General View of the Progress of Metaphysical, Ethical, and Political Philosophy since the Revival of Letters." In 1822 he was struck with paralysis, but recovered a fair degree of health, sufficient to enable him to resume his studies. In 1827 he published the third volume of the *Elements*, and in 1828, a few weeks before his death, *The Philosophy of the Active and Moral Powers.* He died in Edinburgh after a short illness on June 11, 1828.

STEYR, STEIER, or STEYER, an industrial town in Upper Austria, is situated on an island at the junction of the Steyr and Enns, twenty miles to the south of Linz and ninety-two miles to the west-southwest of Vienna. The population in 1880 was 17,199. Steyr was the capital of an early countship or grafschaft, at first belonging to Styria, but annexed to Austria in 1192.

STICKLEBACK is the name applied to a group of small fishes (*Gastrosteus*) which inhabit the fresh and brackish waters as well as the coasts of the temperate zone of the northern hemisphere. Although some of the species live chiefly either in fresh or in salt water, they readily accommodate themselves to a change.

So far as known at present, all sticklebacks construct a nest for the reception of the spawn, which is jealously guarded by the male until the young are hatched, which event takes place in from ten to eighteen days after oviposition. He also protects them for the first few days of their existence, and provides them with food until they gradually stray from their home. The construction of the nest varies in the different species.

Sticklebacks are short-lived animals; they are said to reach an age of only three or four years; yet their short life, at least that of the males, is full of excitement. During the first year of their existence, before the breeding-season begins, they live in small companies in still pools or gently flowing brooks. But with the return of the warmer season each male selects a territory, which he fiercely defends against all comers, especially against intruders of his own species and sex, and to which he invites all females, until the nest is filled with ova. At this period he also assumes a bridal dress, painted with blue and red tints. The eggs are of comparatively large size, one female depositing only from 50 to 100; but, as the females deposit their spawn in nests of different males, the number of ova contained in one nest does not exceed 100.

STIGMATIZATION, literally the infliction of *stigmata*, *i.e.*, marks tattooed or branded on the person, the term used with specific reference to the infliction of wounds like those of Christ.

An ancient and widespread method of showing tribal connection, or relation to tribal deities, is by marks set upon the person; thus Herodotus, in describing a temple of Hercules in Egypt, says that it is not lawful to capture runaway slaves who take refuge therein if they receive certain marks on their bodies, devoting them to the deity. Some such idea is perhaps alluded to by Paul in the words, "from henceforth let no man trouble me, for I bear branded on my body the stigmata of Jesus;" and some few authors have even understood the passage as referring to stigmatization in the modern sense.

In the life of St. Francis of Assisi we have the first example of the alleged miraculous infliction of stigmata. While meditating on the sufferings of our Lord, in his cell on Mount Alverno, we are told by his biographers, Thomas of Celano and Bonaventura, that the Lord appeared to him as a seraph and produced upon his body the five wounds of Christ; of these we are told that the side wound bled occasionally, though Bonaventura calls it a scar, and the wounds in the feet had the appearance and color of nails thrust through. After his death St. Clare endeavored but in vain to extract one of these. Pope Alexander IV. and other witnesses declared that they had seen these marks both before and after his death. The divinely-attested sanctity of their founder gave to the newly-established order of Franciscans a powerful impulse, so that they soon equaled and threatened to overshadow in influence the previously-founded order of St. Dominic.

The reputation of the latter order was, however, equally raised in the next century by the occurrence of the same wonder in the case of a sister of the third rule of St. Dominic, Catherine Benincasa—better known as St. Catherine of Siena. Altogether about ninety instances are on record, of which eighteen were males and seventy-two females. Most of them occurred among residents in religious houses, and took place after the austerities of Lent, usually on Good Friday, when the mind was intently fixed on our Lord's Passion; and, from their occurrence being for the most part among members of the two orders to which St. Francis and St. Catherine belonged, the possibility of the reception of the marks was constantly before their eyes and thoughts. The order of infliction in the majority of cases was that of the crucifixion, the first token being a bloody sweat, followed by the coronation with thorns; afterward the hand and foot wounds appear, that of the side being the last.

The instances of masculine stigmatization are few. Benedict di Rhegio, a Capuchin at Bologna, had the marks of the crown (1602); Carolus Sazia, an ignorant lay brother, had the wound in his side. Dodo, a Præmonstratensian lay brother, was fully stigmatized, as also was Philip de Aqueria. The marks after death were found on the heart of Angelos del Pas, a minorite of Perpignan, as also on Matheo Carery in Mantua, Melchior of Arazel in Valentia, Cherubin de Aviliana (an Angustinian), and Angolini of Milan. Walter of Strasburg, a preaching friar (1264), had the heart-pain but no mark, and the same was the case with a Franciscan, Robert de Malatestis (1430), and James Stephanus. On Nicholas of Ravenna the wounds were seen after death, while John Gray, a Scotsman, a Franciscan martyr, had one wound on his foot.

Within the last hundred years several cases have occurred. Anna Katharina Emmerich, a peasant girl born at Münster in 1774, afterward an Augustinian nun at Agnetenberg, was even more famous for her visions and revelations than for the stigmata.

The last case recorded is that of Louise Lateau, a peasant girl at Bois de Haine, Hainault, upon whom the stigmata appeared April 24, 1868. This case was investigated by Professor Lefebvre of Louvain, who for fifteen years was physician to two lunatic asylums. In her there was a periodic bleeding of the stigmata every Friday, and a frequent recurrence of the hystero-cataleptic condition. Her biography has been written by Lefebvre and published at Louvain (1870).

On surveying these cases, we may discount a certain number as examples of subjective sensations suggested by the contemplation of the pains of crucifixion. A second set must be also set aside as obvious and intentional frauds produced on victims by designing persons. A third series, and how large a group we have not sufficient evidence to decide, we must regard as due to the irresponsible self-infliction of injuries by persons in the hystero-epileptic condition, those perverted states of nervous action which Charcot has done so much to elucidate. To any experienced in this form of disease, many of the phenomena described in the records of these examples are easily recognizable as characteristic of the hystero-epileptic state.

There are, however, some instances not easily explained, where the self-infliction hypothesis is not quite satisfactory. Parallel cases of physical effects due to mental suggestion are well authenticated. Beaunis vouches for rubefaction and vesication as produced by suggestion in the hypnotic state, and Bourru and Burot describe a case, still under observation, of bloody sweat, and red letters marked on the arm by simple tracing with the finger. We know so little of the trophic action of the higher nerve centres that we cannot say how far tissue nutrition can be controlled in spots. That the nerve centers have a direct influence on local nutrition is in some cases capable of experimental demonstration, and, in another sphere, the many authenticated instances of connection between maternal impression and congenital deformity seem to indicate that this trophic influence has wider limits and a more specific capacity of localization than at first sight seems possible. There is no known pathological condition in which blood transudation can take place through an unbroken skin.

STILICHO, Flavius, Roman general and statesman, was of Vandal origin, and was born about 359 A.D. At an early age he entered the imperial army, where his father before him had served under Valens; and he speedily attained high promotion. In 405 he almost annihilated the army of Radagaisus, the leader of the Ostrogoths, at Fiesole. The arrangements into which he subsequently entered with Alaric were made use of by his enemies to alienate the emperor from him, and when at last revolt was the only course that might possibly have saved him his continued loyalty proved fatal. Abandoned by his troops he fled to Ravenna, and, having been induced by false promises to quit the church in which he had taken sanctuary, he was beheaded on August 23, 408.

STILL, John, bishop of Bath and Wells, England, and now best known as the probable author ("Mr. S., Master of Arts") of *Gammer Gurton's Needle*, the earliest comedy but one in the English language, was a native of Grantham, Lincolnshire, and was born about 1543. Still was raised to the bishopric of Bath and Wells in 1592, and, after enjoying considerable fame as a preacher and disputant, he died on February 26, 1607, leaving a large fortune from lead mines discovered in the Mendip Hills.

STILLING, Heinrich. See Jung.

STILLINGFLEET, Edward, a conspicuous figure in the English church of the Restoration, was descended from the Stillingfleets of Stillingfleet, in the neighborhood of York, and was born at Cranbourne in Dorset on April 17, 1635. In 1680 he published his *Unreasonableness of Separation*. Another work which Stillingfleet published in 1662 won for him the confidence and admiration of his church. This was his *Origines Sacræ, or a Rational Account of the Christian Faith as to the Truth and Divine Authority of the Scriptures and the Matters therein contained.* The range of his learning is most clearly seen in his *Bishops' Right to Vote in Parliament in Cases Capital.* His *Origines Britannicæ or Antiquities of the British Church* (1685), is a surprising mixture of critical and uncritical research; and his *Discourse concerning the True Reason of the Sufferings of Christ* (1669), written in answer to Crellius, contains a most forcible statement of the doctrine of Christ's substitution. He died in his house at Westminster, March 28, 1699, and was buried in his own cathedral.

STILLWATER, the capital of Washington county, Minn., is handsomely situated on St. Croix river at the head of Lake St. Croix, twenty miles northeast of St. Paul and seven miles due north from Hudson. The city is surrounded by a rich agricultural country and is extensively engaged in the manufacture of lumber and lumber products. Four railroads, viz., the Chicago, St. Paul, Minneapolis and Omaha, Chicago, Milwaukee and St. Paul, Chicago and Northwestern, and St. Paul and Duluth, add to the importance of the city as a receiving and distributing point, and have also contributed to the improvement of Stillwater by the erection of depots, warehouses, etc. The city contains two national and two savings banks, one daily and three weekly papers, one of the latter being published in the German language, a fine court-house, ten churches, a high school and other school edifices, several handsome public buildings, including The Mannerchor and Grand Opera House, three or more well maintained hotels, and quite a number of stores, private residences, etc. Stillwater is also the location of the state penitentiary. The list of manufactures carried on includes lumber, feed, flour and cement mills, threshing machinery works, dry-docks, harness and harness specialties, hardware specialties, foundry and machine shops, gas and electric light works, traction engines, and other undertakings of minor importance. Steamers ply St. Croix river daily between Stillwater and Taylors Falls and street railways are in operation throughout the city. The latter, however, will give place to electric motors in the near future it is confidently believed. The population was 5,750 in 1870; 9,055 in 1880, and is now (1890) 11,260.

STILT, or LONG-LEGGED PLOVER, a bird so called for reasons obvious to any one who has seen it, since, though no bigger than a Snipe, the length of its legs (their bare part measuring eight inches), in proportion to the size of its body, exceeds that of any other bird's. The first name (a translation of the French *Échasse*, given in 1760 by Brisson) seems to have been bestowed by Rennie only in 1831; but, recommended by its definiteness and brevity, it has wholly supplanted the second and older one. The bird is the *Charadrius himantopus* of Linnæus, the *Himantopus candidus* or *melanopterus* of modern writers, and belongs to the group *Limicolæ*, having been usually placed in the Family *Scolopacidæ*, though it might be quite as reasonably referred to the *Charadriidæ*, and, with its allies to be immediately mentioned, would seem to be not very distant from *Hæmatopus*, notwithstanding the wonderful development of its legs and the slenderness of its bill.

Allied in many ways to the Stilts, but differing in many undeniably generic characteristics, are the birds known as Avosets, forming the genus *Recurvirostra* of Linnæus. Their bill, which is perhaps the most slender to be seen in the whole Class, curves upward toward the end, and has given the oldest known species two names which it formerly bore in England—"Cobbler's-awl," from its likeness to the tool so called, and "Scooper," because it resembled the scoop with which mariners threw water on their sails. The legs, though long, are not extraordinarily so, and the feet, which are webbed, bear a small hind toe.

STIRLING, a midland county of Scotland, is bounded north by Perthshire, northeast by Clackmannan and the Firth of Forth, southeast by Linlithgowshire, south by Lanarkshire and a detached portion of Dumbartonshire, and southwest and west by Dumbartonshire. In the northeast there are two isolated portions, one forming the parish of Alva, bounded partly by Clackmannan and partly by Perthshire, and the other forming part of the parish of Logie and bounded by Perthshire. The outlines of the main portion are extremely irregular, the boundary on the north following for the most part the windings of the Forth, while on the west it passes through the middle of Loch Lomond, and on the south coincides to a considerable extent with various streams. The extreme length of the county from north-west to south-east is about forty-five miles, and the greatest breadth from north to south is about eighteen miles. The land area is 286,338 acres, and the total area 298,579 acres, or about 466 square miles. There are saline mineral springs at Bridge of Allan.

The coalfield runs obliquely along the south-east of the county, the principal seams being at Denny, Kilsyth, Larbert, Falkirk, and Slamannan parishes. Ironstone, fire-clay, and oil-shale are also found. Limestone is extensively wrought in the Campsie district, and there are a number of sandstone quarries in various parts of the county.

The two arable soils of Stirlingshire are distinguished locally as carse and dryfield, the remainder of the county being occupied by mountain pasture land, moor, and moss. The carse of Stirling extends along the banks of the Forth from Buchlyvie to the eastern extremity of the county—a length of about twenty-eight miles, with a breadth varying from one to four miles, the total area being about 30,000 acres. The carse soil consists of the finest clays, without stones, but interspersed with a strata of marine shells. It has been partly reclaimed from superincumbent peat moss, of which there are still considerable areas adjoining it. It requires a great deal of labor, but, by means of draining, subsoil plowing, and the use of lime, has been rendered one of the most fertile soils in Scotland, being specially well adapted for wheat and beans. The dryfield occupies the slopes of the hills above the carse and the valleys in the interior of the county, which constitute the more fertile portions, the crops for which it is best suited being potatoes and turnips. A great part of the dryfield has been reclaimed from moor within the present century. The Lennox Hills, occupying about a fourth of the total area of the county, form one of the most valuable tracts of pasture land in Scotland.

Considerably more than half of the arable area is occupied by rotation grasses and permanent pasture, and their acreage is constantly increasing, which is sufficiently accounted for by the steady increase in the numbers of sheep and cattle. Butter-making is largely practiced on the dryfield farms, the Ayrshire being the principal breed of cows, but cattle-feeding is also an important industry, for which Irish cattle and cross breeds are frequently bought, a considerable number of short-horns being also reared.

Though, as is evident from the remains of trees in the mosses, an extensive district of the county was at one time occupied by forest, it is now comparatively devoid of timber, the area under woods in 1881 being only 12,483 acres. There is a natural tendency to the growth of birch on the lower slopes of the mountains in the parishes of Buchanan and Drymen, and oaks grow extensively on the borders of Loch Lomond. Larch and Scotch firs principally occupy the modern plantations in the other parts of the county.

The Carron ironworks, founded in 1760, for a long time led the van in British iron manufacture, and are still among the most extensive in the kingdom. The Falkirk ironworks, founded in 1819, are the next to them in importance in the county, but there are many others in the same district. The woolen manufacture is next to iron in importance. It includes carpets, tartans, shawls, and tweeds, the principal seats of the industry being Alva, Bannockburn, Cambusbarron, and Stirling. Calico printing is carried on in the western part of the county, especially at Campsie and Milngavie. There are chemical works at Stirling, Falkirk, Denny, and Campsie. Throughout the county there are a considerable number of breweries and distilleries. At Grangemouth, the principal port in the county, shipbuilding is carried on.

Stirling is included with Dumbarton and Clackmannan in the same sheriffdom, but has two sheriff-substitutes, who sit at Stirling and Falkirk respectively, and there are prisons in both towns. The high court of justiciary holds circuit courts at Stirling. There are twenty one entire civil parishes within the county and parts of five others. Stirling (population 12,194) is a royal and police burgh, Falkirk (13,170) a police burgh and burgh of regality, Kilsyth (5,405) a police burgh and burgh of barony, and Alva (4,961), Bridge of Allan (3,005), Denny and Dunipace (4,080), Grangemouth (4,424), and Milngavie (2,636) police burghs. In addition to these the following places had each upward of 2,000 inhabitants: Bannockburn (2,549), Lennoxtown (3,249), and Stenhousemuir (2,617). From 39,761 in 1765 the population of the county had by 1801 increased to 50,825, by 1831 to 72,621, by 1861 to 91,926, by 1871 to 98,176, and by 1881 to 112,443, of whom 56,147 were males and 56,296 were females. The number of persons to the square mile is 251, and in point of density Stirling ranks ninth among the counties of Scotland. One member is returned to parliament by the county, and Stirling and Falkirk are members of separate districts of burghs, which are respectively named from them, each returning one member.

Stirling, a royal and parliamentary burgh and the county town of Stirlingshire, is finely situated on the slopes of an isolated eminence overlooking the valley of the Forth and abruptly precipitous toward the northwest, at the junction of several railway lines, thirty-six miles west-northwest of Edinburgh and thirty north-northeast of Glasgow. The castle crowning the eminence, and commanding a splendid panoramic view of the wide valley between the Lennox Hills and the Highland mountains and Ochils, with the links of the Forth and the widening estuary to the east, is of unknown antiquity, but from the time that Alexander I. died within its walls in 1124 till James VI. ascended the throne of England it was intimately associated with the fortunes of the Scottish monarchs, and after the accession of the Stuarts it became a favorite royal residence. The building was extended by James III., who erected the parliament hall, now used as a barrack-room. The palace, begun by James V. and finished in the reign of Mary, is at the southwest of the fortress, and forms a quadrangle, the front and pillars of which are adorned by quaintly sculptured figures. The royal chapel founded by Alexander I., rebuilt in the fifteenth century, and again by James VI., was subsequently converted into an armory and is now used as a store. To the west of it is the Douglas room, the scene of the treacherous murder of William, eighth earl of Douglas, by James II. in 1452. Below the castle on the northeast is the road of Ballangeich, which supplied a fictitious title to James V. when wandering in disguise. Beyond it is the Gowan or Gowlan Hill, at the west corner of which is Mote Hill or Heading Hill, where Murdock, duke of Albany, and several of his relatives were beheaded in 1425. On the northeast side of the esplanade a statue of King Robert Bruce was erected in 1877. Below the castle rock to the southwest were the king's gardens, now laid out in grass, with an octagonal mound, called the King's Knot, in the center. Farther south is the King's Park, now used for recreation, and as a drill ground. In the cemetery to the south of the castle esplanade there are a number of interesting monuments. Near the main entrance to the esplanade is the building called Argyll's Lodging, erected by the poet, Sir William Alexander, who was created earl of Stirling by Charles I. It passed into the possession of the Argylls in 1640, and was the headquarters of John, duke of Argyll, during the rebellion of 1715. Southwest of it is Mar's Work, the ruins of the palace built as a residence by the earl of Mar about 1570, from the ruins of Cambuskenneth Abbey. Next to the castle the most interesting public building is the Greyfriars church, some portions of which date from the thirteenth century, although the monastery with which it was connected was not founded till 1494. The greater part of it is in the Later Pointed style. The church was the scene of the coronation of James VI., July 29, 1567, when John Knox preached the coronation sermon. The site of the Dominican monastery founded by Alexander II. in 1223 is now occupied by the National Bank. In the immediate neighborhood of Stirling on the other side of the Forth, in Clackmannan county, is the beautiful ruin of Cambuskenneth Abbey, chiefly Early English or First Pointed, founded by David I. in 1147 for canons regular, associated with the meeting of parliaments and other interesting events in Scottish history, and the burial-place of James III. and his queen, Margaret of Denmark.

The population of the royal burgh in 1871 was 10,873 and in 1881 12,194. The population of the parliamentary burgh, which includes the village of St. Ninians, in 1871 was 14,279, and in 1881 it was 16,001.

The town is of unknown antiquity, and undoubtedly owed its origin to the fortress on the rock, which became one of the most important strongholds in Scotland and the center of the struggle between Scotland and England.

STIRLING, Earl of. See Alexander, Sir William.

STIRLING, James, Scotch mathematician, was born at Garden, Stirlingshire, in 1692, and died in Edinburgh in 1770.

STOAT. The English name for Ermine, (*q. v.*)

STOBÆUS, Joannes, a native of Stobi in Macedonia —whence the surname Stobæus or Stobensis—is known to us as the compiler of a very valuable series of extracts from Greek authors. Of his life nothing is known, but he probably belongs to the latter half of the fifth century. From his silence in regard to Christian authors, it is inferred with some probability that he was not a Christian; that he was a man of wide culture and general reading is clear from the anthology which bears his name.

STOCK EXCHANGE, a market for the purchase or sale of all descriptions of public securities. Previous to 1773 the London stockbrokers conducted their business in and about the Royal Exchange, but in that year, having formed themselves into an association under the designation of the Stock Exchange, they, after temporarily locating their headquarters in Sweeting alley, Threadneedle street, removed to Capel court, Bartholomew lane. The growth of business necessitating improved accommodation, a capital of $100,000 in 400 shares of $250 each was raised in 1801 for the purpose of erecting a new building in Capel court, which was finished and occupied in the following year, the members at that date numbering about 500. With the occupation of the new building new rules came into force; all future members were admitted by ballot, while both members and their authorized clerks were required to pay a subscription of ten guineas each. As only the wealthier members of the association had provided the capital for the new building, the Stock Exchange henceforth consisted of two distinct bodies—proprietors and subscribers. In 1854, the membership having increased to about 1,000 persons, an extension of the premises in Capel court was effected at a cost of $80,000. A further and very extensive increase in the accommodation was made in 1885, the number of members and authorized clerks having risen at that date to above 2,500. The extended buildings now occupy the whole of a triangle to the east of the Bank of England, having as its base Bartholomew lane, its north side Throgmorton street, and its south side portions of Threadneedle street and Old Broad street.

On the Continent the two chief centers for the transaction of stock exchange business are Paris and Berlin. In Paris the business can be traced back for about five hundred years, but it was not until 1726 that the Bourse was legally recognized, sixty *agents de change* for the transaction of business being appointed in that year by the king. The Bourse now consists of two distinct bodies, known as the *parquet* and the *coulisse.* The *parquet* is composed of the sixty official brokers or *agents de change* appointed by the government, who alone are admitted to the inner business ring of the Bourse. The *coulisse* are the outside dealers or brokers, but, unlike the same class in London, these comprise firms of solid standing, bankers, and arbitrage houses. Although a partial settlement occurs once a fortnight, the great bulk of the business on the Paris Bourse is settled for once a month, the arrangements connected therewith occupying no less than six days. Another peculiarity in the mode of conducting business in Paris is that sellers can be compelled to deliver stock at any time during the currency of the account. At Berlin the Bourse is not under government control, and although a certain number of licenses are issued any one may act as a broker. The Bourse can be used by the public on payment of an annual subscription, and all debts incurred there are as obligatory in law as ordinary commercial debts. The settlement occupies three days, and occurs at the end of each month.

Although stock exchange business in the United States has now attained enormous proportions, it is of comparatively recent origin. The first organization of brokers in New York dates from about 1820. The mode of conducting business in Wall street differs in some respects from both the English and the Continental procedure. Transactions entered into on one day are settled on the following, and the full amounts involved, and not the mere differences, are paid and received. The jobber, who is of so much importance under the English system, is unknown in New York, as in all cases brokers deal direct with brokers. While stock exchange business in London is of immense variety, and comprises all descriptions of home and foreign government bonds, railway stocks, and miscellaneous shares, in New York it is confined almost entirely to American railway bonds and shares. In these securities, however, the volume of business in active times is enormous, the vast railway system of the United States providing an ample choice for the investor and a wide field for speculative manipulation.

STOCKHOLM, the capital of Sweden, is situated at the point where Lake Mälar mixes its waters with those of the Baltic, and at the meeting-place of two provinces, Upland and Södermanland.

Stockholm was first founded by Birger Jarl, it is said, in the middle of the thirteenth century, at a time when pirate fleets were less common than they had been, and the government was anxious to establish commercial relations with the towns which were now beginning to flourish on the southern coast of the Baltic. The city was originally founded as a fortress on an island at the mouth of Lake Mälar.

The present city has an area of 12.6 square miles (.44 being water); its extreme length from north to south is about 3.8 miles and its circumference 14¼.

In Sweden the cities formerly played a comparatively subordinate part. During the Swedish Middle Ages the prominent classes were the nobility, the clergy, and the peasantry. The anti-aristocratic revolution of the fourteenth and fifteenth centuries had in Sweden its principal supporters among the peasants. But the importance of the cities has gradually increased, and recent times have witnessed an accelerated development, which is best exemplified by the history of Stockholm. The number of inhabitants was, in 1800, 75,517; in 1825, 79,473; in 1850, 93,070; in 1860, 112,391; in 1870, 136,016; in 1880, 168,775; and in 1889, 234,990. Along with the rapid increase of population went a correspondingly increased industrial activity and a considerable development in the means of communication.

The city forms a separate administrative district under a governor (*öfverstathallare*). In ecclesiastical matters it belongs to the archbishopric of Upsala, and the archbishop has the right to preside in its consistory, of which the president generally is the *pastor primarius*, the rector of St. Nicholas. The members of this consistory are the rectors of the other seven territorial parishes and the rectors of the Finnish and German congregations. There is also a court consistory, presided over by the chief court preacher.

It was not until modern times that Stockholm became the capital of Sweden. The mediæval kings visited year by year different parts of the kingdom, where they lived for a shorter or longer time. When from the development of state affairs, the need of a capital came to be felt, no city could compete with the claims of Stockholm. It is the usual residence of the king; in the summer he lives generally in one of the palaces in the neighborhood; some part of every year he passes in his Norwegian capital. The supreme court of justice has its seat in Stockholm, as well as the *Svea Hofrätt*, the next highest tribunal for central and northern Sweden. It is also the seat of all the other central governmental boards.

Stockholm is also the seat of seven academies. There are several private societies of a scientific character. Stockholm has no state university, but there is a high school of medicine (*Carolinska Institute*), which has several professors of mathematics and natural science. The city has also a high technical school, a technical school, a high military school, and a military school (in the palace of Carlberg, outside of the city), a veterinary school, a school of pharmacy, seven more or less complete secondary schools, and two seminaries for female teachers, besides private schools.

STOCKINGS. See HOSIERY.

STOCKPORT, a market-town and municipal and parliamentary borough of England, in Cheshire and partly in Lancashire, is situated on an elevation above the Mersey at the junction of the Tame and Goyt, and of a number of railway lines, forty-six miles east-northeast of Chester, thirty-seven east of Liverpool, and six south-southeast of Manchester. The area is 2,200 acres, with a population in 1871 of 53,014 and in 1881 of 59,553.

STOCKS, as a form of punishment, are now quite obsolete. They were originally established in England after the passing of the Statute of Laborers, 23 Edw. III. c. 1. That Act enjoined that stocks (*ceppes*) should be made in every town between the passing of the Act and Pentecost of that year (1350). By numerous other statutes, until comparatively modern times, the punishment of the stocks was inflicted for offenses of a less heinous kind, *e.g.*, breaches of the Sunday Observance Acts of Charles I. and Charles II.

STOCKTON, situated in the central valley of California near the San Joaquin river, is the county seat of San Joaquin county and a city of many attractive features. It is located on the Central Pacific, ninety miles from San Francisco and about fifty miles from Sacramento at the junction of the Stockton and Copperopolis railroad, and is connected with the San Joaquin river by a navigable channel three miles in length. Steamboats also run between Stockton and Sacramento. The city is surrounded by a highly fertile stretch of country in which nearly all the cereals are extensively cultivated and fruits indigenous to the State are grown in abundance, contributing materially to the city's importance as a shipping point. The growth of Stockton has been gradual but permanent, and the various interests established there represent large investments with results proportionately prosperous. It is the location of the State Insane asylum, also of a convent, and contains in addition other institutions and enterprises of well deserved reputation. They include one national, two savings and two private banks with a combined cash capital of $1,500,000, a court-house, fourteen churches, a high school, and seven grammar schools, two public libraries, public halls with a total seating capacity of 6,000; many hotels, stores, and private residences. The lines of manufacture are full and complete, embracing wines and brandies, chicory, insect powder, brooms, patent medicines, flour, and barley, paper, woolen goods, leather, rubber stamps, agricultural implements, hardware, electrical supplies, boilers, engines, wheels, bodies and gears, carriages, furniture, soap, etc. All modern appliances and improvements, such as electric lights, etc., have been introduced and the departments under municipal control are efficiently managed. The city's population, 10,880 in 1870, is at present (1890) 14,424.

STOCKTON-ON-TEES, a market-town and municipal and parliamentary borough and seaport of Durham, on the borders of the North Riding of Yorkshire, into which the parliamentary borough extends, is situated on the Tees, twenty miles south-southeast of Durham, and four miles west-southwest of Middlesborough. The rapid increase of the town within the last quarter of a century is largely owing to the development of the iron and steel trade in the district. There are extensive steel works, blast-furnaces, iron and brass foundries, and rolling-mills, and iron-shipbuilding is also an important industry. There are also sailcloth works, potteries, breweries, and brick and tile works. The population of the municipal borough (area 1,189 acres) in 1871 was 27,738, and in 1881 it was 41,015. The population of the parliamentary borough (area 7,157 acres) in the same years was 37,612 and 55,457.

STOICS, a school of philosophers founded at the close of the fourth century B.C. by Zeno of Citium, and so called from the Stoa or painted corridor (στοὰ ποικίλν) on the north side of the market-place at Athens, which, after its restoration by Cimon, the celebrated painter Polygnotus had adorned with frescoes representing scenes from the Trojan War.

The history of the Stoic school may conveniently be divided in the usual threefold manner: the old Stoa, the middle or transition period (Diogenes of Seleucia, Boethus of Sidon Panætius, Posidonius), and the later Stoicism of Roman times. Zeno's residence at Athens fell at a time when the great movement which Socrates originated had spent itself in the second generation of his spiritual descendants. Neither Theophrastus at the Lyceum, nor Xenocrates and Polemo at the Academy, nor Stilpo, who was drawing crowds to hear him at Megara, could be said to have inherited much of the great reformer's intellectual vigor, to say nothing of his moral earnestness. Zeno visited all the schools in turn, but seems to have attached himself definitely to the Cynics; as a Cynic he composed at least one of his more important works, "the much admired *Republic*," which we know to have been later on a stumbling-block to the school. In the Cynic school he found the practical spirit which he divined to be the great need of that stirring troublous age. For a while his motto must have been "back to Socrates," or at least "back to Antisthenes." The Stoics always counted themselves among the Socratic schools, and canonized Antisthenes and Diogenes. At the same time, it is certain that the main outlines of the characteristic physical doctrine, which is after all the foundation of their ethics and logic, were the work of Zeno. If the recognition of physics and logic as two studies coördinate with ethics is sufficient to differentiate the mature Zeno from the Cynic author of the *Republic*, no less than from his own heterodox disciple Aristo, the elaboration on all sides of Stoic natural philosophy belongs to Cleanthes, who certainly was not the merely docile and receptive intelligence he is sometimes represented as being. He carried on and completed the assimilation of Heraclitean doctrine; but his own contributions were more distinctive and original than those of any other Stoic.

Yet under this poetical Heraclitean mystic the school was far from flourishing. The eminent teachers of the time are said to have been Aristo, Zeno's heterodox pupil, and Arcesilas, who in Plato's name brought Megarian subtleties and Pyrrhonian agnosticism to bear upon the intruding doctrine; and after a vigorous upgrowth it seemed not unlikely to die out. From all danger of such a fate it was rescued by its third great teacher, Chrysippus; "but for Chrysippus there had been no Porch." Zeno had caught the practical spirit of his age—the desire for a popular philosophy to meet individual needs. But there was another tendency in post-Aristotelian thought—to lean upon authority and substitute learning for independent research—which grew stronger just in proportion as the fresh interest in the problems of the universe and the zeal for discovery declined—a shadow, we may call it, of the coming Scholasticism thrown a thousand years in advance. The representative of this tendency, Chrysippus addressed himself to the congenial task of assimilating, developing, systematizing the doctrines bequeathed to him, and, above all, securing them in their stereotyped and final form, not simply from the assaults of the past, but, as after a long and successful career of controversy and polemical authorship, he fondly hoped, from all possible attack in the future. To his personal characteristics can be traced the hair-splitting and formal pedantry which ever afterward marked the activity of the school, the dry repellent technical procedure of the Dialecticians *par excellence*, as they were called. He created their formal logic and contributed much that was of value to their psychology and epistemology; but in the main his work was to new-label and new-arrange in every department; and to lavish most care and attention on the least important parts—the logical terminology and the refutation of fallacies, or, as his opponents declared, the excogitation of fallacies which even he could not refute. In his *Republic* Zeno had gone so far as to declare the routine education of the day (*e.g.*, mathematics, grammar, etc.) to be of no use. Such Cynic crudity Chrysippus rightly judged to be out of keeping with the requirements of a great dogmatic school, and he labored on all sides after thoroughness, erudition, and scientific completeness. In short, Chrysippus made the Stoic system what it was, and as he left it we proceed to describe it.

The Stoic system is in brief—(*a*) materialism, (*b*) dynamic materialism, lastly (*c*) monism or pantheism. (*a*) The first of these characters is described by anticipation in Plato's *Sophist* (246 C *seq.*), where, arguing with those "who drag everything down to the corporeal" (σῶμα), the Eleatic stranger would fain prove to them the existence of somethng incorporeal, as follows. "They admit the existence of an animate body. Is soul then something existent (οὐσία)? Yes. And the qualities of soul, as justice and wisdom—are they visible and tangible? No. Do they then exist? They are in a dilemma." Now, however effective against Plato's contemporary Cynics or Atomists, the reasoning is thrown away upon the Stoics, who take boldly the one horn of this dilemma. That qualities of bodies (and therefore of the corporeal soul) exist they do not deny; but they assert most uncompromisingly that they are one and all (wisdom, justice, etc.) corporeal. And they strengthen their position by taking Plato's own definition (247 D), namely, "being is that which has the power to act or be acted upon," and turning it against him For this is only true of Body; action, except by contact, is inconceivable; and they reduce every form of causation to the efficient cause, which implies the communication of motion from one body to another. Again and again, therefore, only Body exists. The most real realities to Plato and Aristotle had been thought and the objects of thought, νοῦς and νοητά, whether abstracted from sensibles or inherent in "matter," as the incognizable basis of all concrete existence. But this was too great an effort to last long. Such spiritualistic theories were nowhere really maintained after Aristotle and outside the circle of his immediate followers. The reaction came and left nothing of it all; for five centuries the dominant tone of the older and the newer schools alike was frankly materialistic. (*b*) But the doctrine that all existence is confined within the limits of the sensible universe—that there is no being save corporeal being or body—does not suffice to characterize the Stoic system; it is no less a doctrine of the Epicureans. It is the idea of tension as the essential attribute of body, in contradistinction to passive inert matter, which is distinctively Stoic. The Epicureans leave unexplained the primary constitution and first movements of their atoms or elemental solids; chance or declination may account for them. Now, to the Stoics nothing passes unexplained; there is a reason (λόγος) for everything in nature. Everything which exists is at once capable of acting and being acted upon. In everything that exists, therefore, even the smallest particle, there are these two principles. By virtue of the passive principle the thing is susceptible of motion and modification; it is matter which determines substance (οὐσία). The active principle makes the matter a given determinate thing, characterizing and qualifying it, whence it is termed quality (ποιότης). For all that is or happens there is an immediate cause or antecedent; and as "cause" means "cause of motion," and only body can act upon body, it follows that this antecedent cause is itself as truly corporeal as the matter upon which it acts. Thus we are led to regard the active principle "force" as everywhere co-extensive with "matter," as pervading and permeating it, and together with it occupying and filling space. (*c*) What then, we ask, is the relation between the active and the passive principles? Is there, or is there not, an essential distinction between substance or matter and pervading force or cause or quality? Here the Stoa shows signs of a development of doctrine. Zeno began, perhaps, by adopting the formulas of the Peripatetics, though no doubt with a conscious difference, postulating that form was always attached to matter, no less than matter, as known to us, is everywhere shaped or informed. Whether he ever overcame the dualism which the sources, such as they are, unanimously ascribe to him is not clearly ascertained. It seems probable that he did not. But we can answer authoritatively that to Cleanthes and Chrysippus, if not to Zeno, there was no real difference between matter and its cause, which is always a corporeal current, and therefore matter, although the finest and subtlest matter. In fact they have reached the final result of unveiled hylozoism, from which the distinction of the active and passive principles is discerned to be a merely formal concession to Aristotle, a legacy from his dualistic doctrine. His technical term Form (εἶδος) they never use, but always Reason or God. This was not the first time that approaches had been made to such a doctrine, and Diogenes of Appolonia in particular was led to oppose Anaxagoras, who distinguished Nous or Thought from every other agent within the cosmos which is its work, by postulating as his first principle something which should be at once physical substratum and thinking being. But until dualism had been thought out, as in the Peripatetic school, it was impossible that monism (or at any rate materialistic monism) should be definitely and consciously maintained. One thing is certain: the Stoics provided no loophole of escape by entrenching upon the "purely material" nature of matter; they laid down with rigid accuracy its two chief properties—extension in three dimensions, and resistance, both being traced back to force. There were, it is true, certain inconsistent conceptions, creations of thought to which nothing real and external corresponded, namely, time, space, void, and the idea expressed in language (λεκτόν). But this inconsistency was covered by another: though each of these might be said to be something, they could not be said to exist.

If in the science of nature the Stoics can lay claim to no striking originality, the case is different when we come to the science of man. In the rational creatures—man and the gods—Pneuma is manifested in a high degree of purity and intensity as an emanation from the world-soul, itself an emanation from the primary substance of purest ether—a spark of the celestial fire, or, more accurately, fiery breath, which is a mean between fire and air, characterized by vital warmth more than by dryness. The physical basis of Stoic psychology deserves the closest attention. On the one hand, soul is corporeal, else it would have no real existence, would be incapable of extension in three dimensions (and therefore of equable diffusion all over the body), incapable of holding the body together, as the Stoics contended that it does, herein presenting a sharp contrast to the Epicurean tenet that it is the body which confines and shelters the light vagrant atoms of soul. On the other hand, this corporeal thing is veritably and identically reason, mind, and ruling principle (λόγος, νοῦς, ἡγεμονικόν); in virtue of its divine origin Cleanthes can say to Zeus, "We too are thy offspring," and a Seneca can calmly insist that, if man and God are not on perfect equality, the superiority rests rather on our side. What God is for the world that the soul is for man. The Cosmos must be conceived as a single whole, its variety being referred to varying stages of condensation in Pneuma. So, too, the human soul must possess absolute simplicity, its varying functions being conditioned by the degrees or species of its tension. It follows that of "parts" of the soul, as previous thinkers imagined, there can be no question; all that can consistently be maintained is that from the center of the body—the heart—seven distinct air-currents are discharged to various organs, which are so many modes of the one soul's activity. The ethical consequences of this position will be seen at a later stage. With this psychology is intimately connected the Stoic theory of knowledge. From the unity of soul it follows that all psychical processes—sensation, assent, impulse—proceed from reason, the ruling part; that is to say, there is no strife or division: the one rational soul alone has sensations, assents to judgments, is impelled toward objects of desire just as much as it thinks or reasons. Not that all these powers at once reach full maturity. The soul at first is void of content; in the embryo it has not developed beyond the nutritive principle of a plant (φύσις): at birth the "ruling part" is a blank tablet, although ready prepared to receive writing. This excludes all possibility of innate ideas or any faculty akin to intuitive reason. The source of all our knowledge is experience and discursive thought, which manipulates the materials of sense. Our ideas are copied from stored-up sensations. No other theory was possible upon the foundation of the Stoic physics.

The practical philosophy of the Stoics stands in the closest connection with their physics and psychology. Holding that man is a being who acts as well as thinks, and that this is the all-important side of his life, they find the link between the two in the mind's assent; for, when impelled toward certain objects by a prompting or "impulse" (ὁρμή= movement of the soul seeking to possess itself of certain external things), whether of nature or reason, a man must needs judge the objects to be desirable; the subsequent movement, as it were, translates this judgment into action.

In their view of man's social relations the Stoics are greatly in advance of preceding schools. They taught that virtue is a law which governs the universe: that which Reason and God ordain must be accepted as binding upon the particle of reason which is in each one of us. Human law comes into existence when men recognize this obligation; justice is therefore natural, and not something merely conventional. The opposite tendencies, to allow to the individual responsibility and freedom, and to demand of him obedience to law, are both features of the system; but in virtue even of the freedom which belongs to him *qua* rational, he must recognize the society of rational beings of which he is a member, and subordinate his own ends to the ends and needs of this society. Those who own one law are citizens of one state, the city of Zeus, in which men and gods have their dwelling. In that city all is ordained by reason working intelligently, and the members exist for the sake of one another; there is an intimate connection (συμπάθεια) between them which makes all the wise and virtuous friends, even if personally unknown, and leads them to contribute to one another's good. Their intercourse should find expression in justice, in friendship, in family and political life. But practically the Stoic philosopher always had some good excuse for withdrawing from the narrow political life of the city in which he found himself.

The religious problem had peculiar interest for the school which discerned God everywhere as the ruler and upholder, and at the same time the law, of the world that He had evolved from Himself. The physical groundwork lends a religious sanction to all moral duties.

To the orthodox theology of Greece and Rome the system stood in a twofold relation, as criticism and rationalism. That the popular religion contained gross errors hardly needed to be pointed out. The forms of worship were known to be trivial or mischievous, the myths unworthy or immoral. But Zeno declared images, shrines, temples, sacrifices, prayers, and worship to be of no avail. A really acceptable prayer, he taught, can only have reference to a virtuous and devout mind: God is best worshiped in the shrine of the heart by the desire to know and obey Him. At the same time the Stoics felt at liberty to defend and uphold the truth in polytheism. Moreover, the myths were rationalized and allegorized, which was not in either case an original procedure. The search for a deeper hidden meaning beside the literal one had been begun by Democritus, Empedocles, the Sophists, and the Cynics. It remained for Zeno to carry this to a much greater extent, and to seek out or invent "natural principles" (λόγοι φυσικοί) and moral ideas in all the legends and in the poetry of Homer and Hesiod. In this sense he was the pattern if not the "father" of all such as allegorize and reconcile. Etymology was pressed into the service, and the wildest conjectures as to the meaning of names did duty as a basis for mythological explanations. The two favorite Stoic heroes were Hercules and Ulysses, and nearly every scene in their adventures was made to disclose some moral significance. Lastly, the practice of divination and the consultation of oracles afforded a means of communication between God and man—a concession to popular beliefs which may be explained when we reflect that to the faithful divination was something as essential as confession and spiritual direction to a devout Catholic now, or the study and interpretation of Scripture texts to a Protestant. Chrysippus did his best to reconcile the superstition with his own rational doctrine of strict causation.

When Chrysippus died (Ol. 143=208–204 B.C.) the structure of Stoic doctrine was complete. With the Middle Stoa we enter upon a period at first of comparative inaction, afterward of internal reform. Chrysippus' immediate successors were Zeno of Tarsus. Diogenes of Seleucia (often called the Babylonian), and Antipater of Tarsus, men of no originality, though not without ability; the two last named, however, had all their energies taxed to sustain the conflict with CARNEADES, (*q.v.*) This was the most formidable assault the school ever encountered; that it survived was due more to the foresight and elaborate precautions of Chrysippus than to any efforts of that "pen-doughty" phampleteer, Antipater καλαμοβόας, who shrank from opposing himself in person to the eloquence of Carneades. The special objects of attack were the Stoic theory of knowledge, their theology, and their ethics. The physical basis of the system remained unchanged but neglected; all creative force or even original research in the departments of physics and metaphysics vanished. Yet problems of interest bearing upon psychology and natural theology continued to be discussed. Thus the cycles of the world's existence, and the universal conflagration which terminates each of them, excited some doubt. Diogenes of Seleucia is said to have wavered in his belief at last; Boethus, one of his pupils, flatly denied it. He regarded the Deity as the guide and upholder of the world, watching over it from the outside, not as the immanent soul within it, for according to him the world was as soulless as a plant. We have here a compromise between Zeno's and Aristotle's doctrines. But in the end the universal conflagration was handed down without question as an article of belief. It is clear that the activity of these teachers was chiefly directed to ethics. They elaborated fresh definitions of the chief good, designed to make yet clearer the sense of the formulas of Chrysippus or else to meet the more urgent objections of the New Academy.

The introduction of Stoicism at Rome was the most momentous of the many changes that it saw. After the first sharp collision with the jealousy of the national authorities it found a ready acceptance, and made rapid progress among the noblest families. It has been well said that the old heroes of the republic were unconscious Stoics, fitted by their narrowness, their stern simplicity, and devotion to duty for the almost Semitic earnestness of the new doctrine. In Greece its insensibility to art and the cultivation of life was a fatal defect; not so with the shrewd men of the world, desirous of qualifying as advocates or jurists. It supplied them with an incentive to scientific research in archæology and grammar; it penetrated jurisprudence until the belief in the ultimate identity of the *jus gentium* with the law of nature modified the prætor's edicts for centuries. Even to the prosaic religion of old Rome, with its narrow original conception and multitude of burdensome rites, it became in some sort a support.

The writings of the later Stoics have come down to us, if not entire, in great part, so that Seneca, Cornutus, Persius, Lucan, Epictetus, Marcus Aurelius are known at first hand. They do not profess to give a scientific exposition of doctrine, and may therefore be dismissed somewhat briefly (see EPICTETUS and AURELIUS). We learn much more about the Stoic system from the scanty fragments of the first founders, or even from the epitomes of Diogenes Laertius and Stobæus, than from these writers. They testify to the restriction of philosophy to the practical side, and to the increasing tendency, ever since Panætius, toward a relaxation of the rigorous ethical doctrine and its approximation to the form of religious conviction. This finds most marked expression in the doctrines of submission to Providence and universal philanthropy. Only in this way could they hold their ground, however insecurely, in face of the religious reaction of the first century. In passing to Rome, Stoicism quitted the school for actual life. The fall of the republic was a gain, for it released so much intellectual activity from civic duties. The life and death of Cato fired the imagination of a degenerate age in which he stood out both as a Roman and a Stoic. To a long line of illustrious successors, men like Pætus Thrasea and Helvidius Priscus, Cato bequeathed his resolute opposition to the dominant power of the times; unsympathetic, impracticable, but fearless in demeanor, they were a standing reproach to the corruption and tyranny of their age. But when at first, under Augustus, the empire restored order, philosophy became bolder and addressed every class in society, public lectures and spiritual direction being the two forms in which it mainly showed activity. Books of direction were written by Sextius in Greek (as afterward by Seneca in Latin), almost the only Roman who had the ambition to found a sect, though in ethics he mainly followed Stoicism. His contemporary Papirius Fabianus was the popular lecturer of that day, producing a powerful effect by his denunciations of the manners of the time. Under Tiberius, Sotion and Attalus were attended by crowds of hearers. In Seneca's time there was a professor, badly attended it is true, even in a provincial town like Naples. At the same time the antiquarian study of Stoic writings went on apace, especially those of the earliest teachers—Zeno and Aristo and Cleanthes.

Seneca is the most prominent leader in the direction which Roman Stoicism now took. His penetrating intellect had mastered the subtleties of the system of Chrysippus, but they seldom appear in his works, at least without apology. Incidentally we meet there with the doctrines of Pneuma and of tension, of the corporeal nature of the virtues and the affections, and much more to the same effect. But his attention is claimed for physics chiefly as a means of elevating the mind, and as making known the wisdom of Providence and the moral government of the world.

From Seneca we turn, not without satisfaction, to men of sterner mold, such as Musonius Rufus, who certainly deserves a place beside his more illustrious disciple, Epictetus. As a teacher he commanded universal respect, and wherever we catch a glimpse of his activity in these perilous times—whether banished by Nero, or excepted from banishment by Vespasian, as the judicial prosecutor of that foul traitor Egnatius Celer, or as thrusting himself between the ranks of Vespasianists and Vitellianists, to preach conciliation on the eve of a battle—he appears to advantage. His philosophy, however, is yet more concentrated upon practice than Seneca's, and in ethics he is almost at the position of Aristo. Virtue is the sole end, but virtue may be gained without many doctirnes, mainly by habit and training. Epictetus testifies to the powerful hold he acquired upon his pupils, each of whom felt as if Musonius spoke to his heart. Among a mass of his practical precepts, we come across an original thought, the famous distinction between "things in our power," *i.e.*, our ideas and imaginations, and "things beyond our power," *i.e.*, the course of events and external advantages. The practical lesson drawn from it is, that we must school ourselves to accept willingly the inevitable.

In the life and teaching of Epictetus this thought bore abundant fruit. The beautiful character which rose superior to weakness, poverty, and slave's estate is also presented to us in the *Discourses* of his disciple Arrian as a model of religious resignation, of forbearance and love toward our brethren, that is, toward all men, since God is our common father. With him even the "physical basis" of ethics takes the form of a religious dogma—the providence of God and the perfection of the world.

Epictetus is marked out among Stoics by his renunciation of the world. He is followed by a Stoic emperor, M. Aurelius Antoninus, who, though in the world, was not of it. The *Meditations* give no systematic exposition of belief, but there are many indications of the religious spirit we have already observed, together with an almost Platonic psychology. None of the ancient systems fell so rapidly as the Stoa. It had just touched the highest point of practical morality, and in a generation after M. Antoninus there is hardly a professor to be named. Its most valuable lessons to the world were preserved in Christianity; but the grand simplicity of its monism slumbered for fifteen centuries before it was revived by Spinoza.

STOKE-UPON-TRENT, a market-town and municipal and parliamentary borough of Staffordshire, is situated on the Trent, on the Trent and Mersey canal, where it unites with the Cauldon canal, and on the London and North-Western and North Staffordshire railway lines, two miles east of Newcastle-under-Lyme, and fifteen north of Stafford. It may be regarded as the center of the "Potteries" district. Stoke was created a parliamentary borough in 1832, with two members, but by the Act of 1885 a large part of this went to form the new borough of Hanley. The population of the municipal borough (formed in 1874, with an area of of 1,660 acres) was 19,261 in 1881; the area has since been increased to 1,720 acres. The population of the parliamentary borough (area 9,081 acres) in 1871 was 130,985, and in 1881 it was 152,394; the population of the borough as adjusted in 1885, which returns only one member, is estimated at 65,000.

STOLBERG, or STOLLBERG, an industrial and mining town in Rhenish Prussia, is situated on the Vicht, seven miles east of Aix-la-Chapelle. It is the center of a very active and varied industry, exporting its produce to all parts of the world. The leading branch is metal-working, which is here carried on in important zinc, brass, and iron foundries, smelting-works of various kinds, puddling and rolling works, and manufactories of needles, pins, and other metal goods. There are also large chemical works, glass-works, a mirror-factory, and various minor establishments. Extensive coal-mines in the neighborhood provide the enormous supply of fuel demanded by the various industries. The population is 13,000.

STOLBERG, COUNT CHRISTIAN, German poet, was born at Hamburg on October 15, 1748. His father, Count Christian Günther, was a privy councilor in Denmark. Stolberg studied at Göttingen, where he formed one of a "Dichterbund," which afterward became famous. It included, besides Stolberg and his brother, Boie, Bürger, Miller, Voss, Hölty, and Leisewitz. In 1777 he became an official in the civil service at Tremsbüttel in Holstein, and married Louise, the countess of Reventlow, whose beauty he had often celebrated in his verses. He resigned his office in 1800, and died January 18, 1821.

STOLBERG, Count Frederick Leopold, brother of the preceding, was born on November 7, 1750, in Holstein. Like his brother he studied at Göttingen, and was a member of the "Dichterbund." In 1776 he went to Copenhagen as ambassador of the prince-bishop of Lübeck, and in 1789 he was sent to Berlin as the ambassador of the king of Denmark. In 1800 he resigned his office, and at Münster joined the Church of Rome, taking with him all the members of his family except his eldest daughter, Agnes, who had married Count Ferdinand von Stolberg-Wernigerode. Stolberg's friends and admirers were astonished by his conversion to the Roman Church, and he was hotly attacked by Voss, whose intervention gave rise to a bitter controversy. After his change of faith Stolberg issued an elaborate *Geschichte der Religion Jesu Christi*, in which he hardly even attempted to write with impartial judgment. He died near Osnabrück on December 5, 1819.

STOLP, or Stolpe, an ancient trading-town in the bleak coast-plain of eastern Pomerania, Prussia, is situated on the Stolpe, ten miles from the Baltic Sea and sixty-four miles to the west of Dantzic. The manufacture of amber articles, tobacco and cigars, cigar-boxes, etc., with some iron-founding, linen-weaving, and salmon-fishing in the Stolpe, are the chief industrial occupations of the inhabitants, who also carry on trade in grain, cattle, spirits, fish, and geese. The population of Stolp is 22,431.

STOMACH. See Digestive Organs.

STOMACH, Diseases of the. Only the more common and serious varieties of gastric disease can be here referred to. The majority of them exhibit, as their most marked and sometimes their only feature, the symptoms of Dyspepsia, (*q.v.*) Hence the diagnosis of the forms of stomach disease is frequently a matter of much difficulty. Nevertheless a careful consideration of the history and the manifested phenomena of a given case may often lead to a correct identification of its nature. The present notice refers in general terms to the most prominent symptoms which usually characterize the chief gastric disorders.

The stomach is liable to inflammatory affections, of which the condition of catarrh, or irritation of its mucous membrane, is the most frequent and most readily recognized. This may exist in an acute or a chronic form, and depends upon some condition, either local or general, which produces a congested state of the circulation in the walls of the stomach.

Acute Gastric Catarrh may arise from various causes, of which the most important are—(1) constitutional conditions, such as the gouty or rheumatic, or an inherited tendency to irritability of the digestive organs; (2) errors in diet, particularly excessive quantity, indigestible quality, imperfect mastication, extremes of temperature of the food, toxic agents, especially alcohol, in excess, or food in a state of decomposition; (3) atmospheric influences, as appears evident from its tendency to occur in very warm or very cold weather or in the case of sudden temperature alternations.

The chief change the stomach undergoes affects its mucous membrane, which is in a state of congestion, either throughout or in parts. It is more than probable that this condition produces an alteration in the secreting function of the organ, and that its peptic juices become less potent, the effect of which will be to retard the process of digestion and favor the occurrence of decomposition and fermentation in its contents, thus aggravating the original evil. The symptoms are those well known as characterizing an acute "bilious attack," consisting in loss of appetite, sickness or nausea, and headache, frontal or occipital, often accompanied with giddiness. The tongue is furred, the breath fetid, and there is pain or discomfort in the region of the stomach, with sour eructations, and frequently vomiting, first of food and then of bilious matter. An attack of this kind tends to subside in a few days, especially if the exciting cause be removed. Sometimes, however, the symptoms recur with such frequency as to lead to the more serious chronic form of the disease.

The treatment bears reference, in the first place, to any known source of irritation, which, if it exist, may be expelled by an emetic or purgative. This, however, is seldom necessary, since vomiting is usually present. For the relief of sickness and pain the sucking of ice and counter-irritation over the region of the stomach are of service. Further, remedies which exercise a soothing effect upon an irritable mucous membrane, such as bismuth or weak alkaline fluids, and along with these the use of a light milk diet, are usually sufficient to remove the symptoms.

Chronic Gastric Catarrh may result from the acute or may arise independently. It is not infrequently connected with antecedent disease in other organs, such as the lungs, heart, liver, or kidneys, and it is specially common in persons addicted to alcoholic excess. In this form the texture of the stomach is more seriously affected than in the acute. It is permanently in a state of congestion, and its mucous membrane and muscular coat undergo thickening, and other changes, which, besides markedly affecting the function of digestion, may lead to stricture of the pyloric orifice of the stomach and its results, to be subsequently referred to. The symptoms are those of dyspepsia in an aggravated form (see Dyspepsia), of which discomfort and pain after food, with distension and frequently vomiting, are the chief; and the treatment must be conducted in reference to the causes giving rise to it. The careful regulation of the diet (see Dietetics), both as to the amount, the quality, and the intervals between meals, demands special attention. Of medicinal agents, bismuth, arsenic, nux vomica, and the mineral acids are all of acknowledged efficacy, as are also preparations of pepsin.

Ulcer of the Stomach (gastric ulcer, perforating ulcer) is of not infrequent occurrence, and is a disease of much gravity. Its causes are probably not fully understood. When any obstruction takes place in a blood-vessel the nutrition of a limited area of the stomach is cut off, and the part is apt to undergo disintegration all the more readily from the unresisted action of the gastric juices upon it. Hence an ulcer is formed. This ulcer is usually of small size (one-fourth to one inch in diameter), of round or oval form, and tends to advance, not superficially, but to penetrate through the coats of the stomach. Its most usual site is upon the posterior wall of the upper or lesser curvature of the stomach and near to the pyloric orifice. It may undergo a healing process at any stage, in which case it may leave but little trace of its existence; while, on the other hand, it may in the course of cicatrizing produce such an amount of contraction as to lead to stricture of the pylorus. But, again, perforation may take place, which in most cases is quickly fatal, unless previously the stomach has become, as it may, adherent to another organ, by which the dangerous effects of this occurrence may be averted. Usually there is but one ulcer, but sometimes there are more.

Of prime importance in the treatment of this disease is the careful adjustment of the diet, the conditions existing in the stomach obviously requiring that the food administered should be of as bland and soft a character as possible. Of all substances milk forms the most suitable aliment, and, while there may be instances in which it fails to agree, even when mixed with lime water or previously boiled, these are comparatively few. Light soups, as well as milk, may sometimes be administered in this way with benefit. In severe cases, where the presence of food in the stomach gives rise to much suffering, nourishment by the bowel may be given for a time with great advantage. Of medicinal remedies the most serviceable are large doses of bismuth, with which it may be necessary to conjoin small doses of opium or of hydrocyanic acid for the relief of pain.

Cancer of the Stomach is one of the most common forms of internal cancerous disease. It occurs for the most part in persons at or after middle life, and in both sexes equally. Hereditary tendency may not infrequently be traced.

The most common varieties of cancer affecting the stomach are scirrhus, medullary, and colloid, and the parts affected are usually the inlet or outlet orifices; but the morbid process may spread widely in the stomach wall. When in the neighborhood of the pylorus a stricture is frequently produced as the disease advances. The cancerous growth usually commences in the submucous tissue, but as it progresses it tends to ulcerate through the mucous membrane, and in this process hemorrhage and hematemesis may occur. The symptoms of this disease are in many instances so indefinite as to render the diagnosis for a long time conjectural. They are mostly those of dyspepsia, with more or less pain, discomfort, and vomiting, particularly after meals. The vomited matters are often of coffee-ground appearance, due to admixture with blood, but copious hematemesis is less frequent than in cases of gastric ulcer. The patient loses flesh and strength and soon comes to acquire the cachectic aspect commonly associated with cancer. The diagnosis is rendered all the more certain when, as is frequently the case, a tumor can be detected on examination over the region of the stomach, but there are many instances where no such evidence is obtained and where the nature of the disease is left to be made out by the age of the patient and by the intractable and and progressive character of the symptoms. Cases of cancer of the stomach advance with more or less rapidity to a fatal termination, which is usually quickest in the medullary form. In most instances death takes place in from six to twelve months. The treatment can only be palliative, but much relief may often be afforded by a careful attention to diet, by the treatment applicable to dilatation of the stomach, and by the use of opium.

STONE, a market town of Staffordshire, England, on the river Trent, seven miles south of Stoke and seven north of Stafford. Part of the walls remain of an abbey which dates from the foundation of a college of canons in 670. The present church was opened in 1750. The inhabitants are employed chiefly in shoemaking, but malting, brewing, and tanning are also carried on. The population of the urban sanitary district is 6,000.

STONE. See Vesical Diseases.

STONE, a weight used throughout the northwest and central countries of Europe, but varying much in different countries. It is chiefly employed on the continent for weighing wool, hemp, flax, and feathers, the flax stone containing twice as many pounds as the one used for wool and feathers. In Great Britain, though the stone of fourteen pounds is the only legal imperial weight of the kind, stones of other values are in regular use, as a stone of twenty-four pounds for wool, and of eight pounds for butcher meat.

STONEHAM, a village of Massachusetts, located in Stoneham township, and Middlesex county, derives its principal importance as a manufacturing town. It is nine miles from Boston, on the Boston, Lowell and Nashua, and one and a half miles from the main line of the Boston and Maine railroad. It is also connected with Boston by street railways. The most extensive industry carried on is the manufacture of boots and shoes, there being no less than twenty-eight establishments thus engaged, besides other productive enterprises, including paper boxes, pencil-sharpeners, dies, soap, etc. The village contains one bank, two weekly papers, five churches, schools, academies, stores, and residences, etc., and in 1 90 had a population of 6,140.

STONEHENGE, one of the most remarkable examples of the ancient stone circles, is situated in Salisbury Plain, Wiltshire, about seven miles north of Salisbury, England. It consists of two circles and two ovals with a large stone in the center. The outer circle, about 300 feet in circumference, is composed of upright stones about sixteen feet in height and eighteen feet in circumference, with others of similar size placed horizontally on their tops. Originally there were thirty uprights and thirty imposts, but now only seventeen uprights and seven imposts retain their position. The inner circle, which is about nine feet distant from the outer circle, consisted originally of forty single stones, much smaller in size, and, unlike those of the outer circle, showing no evidence of having been hewn. The inner oval consisted originally of nineteen stones, of which there are remains of eleven, tapering in form and taller than those of the inner circle. In the center of the smaller oval is the supposed altar stone, fifteen feet in length. The whole is surrounded by a vallum and ditch about 370 yards in circumference.

Stonehenge is first mentioned by Nennius, in the ninth century, who asserts that it was erected in commemoration of the 400 nobles who were treacherously slain near the spot by Hengist in 472. Inigo Jones, in his work on Stonehenge, published in 1655, endeavors to prove that it was a temple of the Romans, but later writers of authority are generally agreed that it is of Druidical origin, although there are differences of opinion as to its probable date, some placing it at 100 years before Christ and others in the fifth century.

STONE MASONRY. See Building.

STONINGTON, a borough and seaport in New London county, Conn., is situated on Long Island Sound, 139 miles from New York. It is built on a narrow rocky point, and is a quiet, quaint-looking town, largely frequented as a summer watering-place. Its industries comprise silk-throwing and the manufacture of silk machinery, and it has a considerable interest in sealing. The harbor is protected by two breakwaters; it is the terminus of a daily line of steamers from New York. The population of the township is 7,346.

STONYHURST COLLEGE, seven miles northeast of Blackburn, Lancashire, a Roman Catholic institution founded in 1794, was affiliated to London University in 1863, and prepares candidates for matriculation at the universities and for the civil and military services. It has a staff of about twenty professors and masters.

STORACE, Stephen, dramatic composer, was born in London in 1763. His father, Stefano Storace, an Italian contrabassist, taught him the violin so well that at ten years old he played successfully the most difficult music of the day. After completing his education at the Conservatorio di Sant' Onofrio at Naples, he produced his first opera, *Gli Sposi Malcontenti*, at Vienna, in 1785. Here he made the acquaintance of Mozart, in whose *Nozze di Figaro* his sister, Anna Selina Storace, first sang the part of Susanna. His greatest triumphs were achieved in England, whither he returned in 1787. After creating a favorable impression by bringing out his *Singspiel* at Drury Lane, under the title of *The Doctor and the Apothecary*, Storace attained his first great success in 1789, in *The Haunted Tower*, a genuine English opera, which ran for fifty nights in succession, and retained its popularity long after the opening of the present century. *No Song no Supper* was equally successful in 1790; and *The Siege of Belgrade* scarcely less so in 1791. The music of *The Pirates*, produced in 1792, was partly adapted from *Gli Equivoci*, and is remarkable as affording one of the earliest instances of the introduction of a grand *finale* into an English opera. Storace died March 19, 1796.

STORAX. It has been explained in INCENSE and LIQUIDAMBAR that the storax of commerce and the pharmacopœia (used as an emollient) is derived from the Oriental liquidambar tree. The storax of the ancients, on the other hand, a solid gum which does not now occur in commerce, appears to have been the product of the beautiful white-flowered shrub *Styrax officinalis*, which is still common on Carmel and elsewhere in Syria. It was much used as an incense, and formed an early and important article of Phœnician trade.

STORK (A.S. *Storc*; Germ. *Storch*), the *Ciconia alba* of ornithology, and, through picture and story, one of the best known of birds. It is a summer-visitant to most parts of the European continent—the chief exceptions being France (where the native race has been destroyed), Italy, and Russia—breeding from southern Sweden to Spain and Greece, and being especially common in Poland. It reappears again in Asia Minor, the Caucasus, Persia, and Turkestan, but further to the eastward it is replaced by an allied species. *C. boyciana*, which reaches Japan. Though occasionally using trees (as was most likely its original habit) for the purpose, the Stork most generally places its nest on buildings, a fact familiar to travelers in Denmark, Holland, and Germany, and it is nearly everywhere a cherished guest, popular belief ascribing good luck to the house to which it attaches itself. Its food, consisting mainly of frogs and insects, is gathered in the neighboring pastures. Apart from its considerable size—and a Stork stands more than three feet in height—its contrasted plumage of pure white and deep black, with its bright red bill and legs, makes it a conspicuous and beautiful object, especially when seen against the fresh green grass of a luxuriant meadow. In winter the Storks of Europe retire to Africa—some of them, it would seem, reaching the Cape Colony—while those of Asia visit India. A second species, with much the same range, but with none of its relative's domestic disposition, is the Black Stork, *C. nigra*, of which the upper parts are black, brilliantly glossed with purple, copper, and green, while it is white beneath—the bill and legs, with a patch of bare skin round the eyes, being red.

STORMS. See METEOROLOGY.

STORY, JOSEPH, was born at Marblehead, Mass., September 18, 1779, graduated at Harvard in 1798, and was admitted to the bar in Massachusetts in 1801. He was a member of the Democratic party, then weak in New England but all-powerful in the rest of the Union; and his district made him its representative in Congress for 1808-9. In 1811 one of the associate-justiceships of the United States supreme court became vacant, and Story was appointed to it, retaining the office for life. Here he found his true sphere of work. The traditions of the American people, their strong prejudice for the local supremacy of the States and against a centralized government, had yielded reluctantly to the establishment of the federal legislative and executive in 1789. The federal judiciary had been organized at the same time, but had never grasped the full measure of its powers. Soon after Story's appointment the supreme court began to bring out into plain view the powers which the constitution had given it over State courts and State legislation. The leading place in this work belongs to Chief-Justice John Marshall, but Story has a very large share in that remarkable series of decisions and opinions, from 1812 until 1832, by which the work was accomplished. In addition to this he built up the department of admiralty law in the United States courts; and his *Commentaries on the American Constitution* are still the leading authority on the interpretation of that instrument. He died at Cambridge, Mass., where he was the head of the Harvard law school, September 10, 1845.

STOTHARD, CHARLES ALFRED, antiquarian draughtsman, son of Thomas Stothard, noticed below, was born in London on July 5, 1786. After studying in the schools of the Royal Academy, he began, in 1810, his first historical piece, the Death of Richard II. in Pomfret Castle. He published in 1811 the first part of his valuable work, *The Monumental Effigies of Great Britain*. He was appointed historical draughtsman to the Society of Antiquaries, and was deputed by that body to visit Bayeux, to make drawings of the well-known tapestry. He was made a fellow of the society in 1819, and subsequently engaged in numerous journeys with the view of illustrating the works of D. Lysons. While engaged in tracing a portrait from one of the windows of the church of Beer-Ferrers, Devonshire, he fell and was killed on the spot (May 27, 1821).

STOTHARD, THOMAS, subject painter, was born in London on August 17, 1755. He was apprenticed to a draughtsman of patterns for brocaded silks in Spitalfields, and during his leisure hours made illustrations to the works of his favorite poets. Some of these drawings were praised by Harrison, the editor of the *Novelist's Library*, and, Stothard's master having died, he resolved to devote himself to art. In 1778 he became a student of the Royal Academy, of which he was elected associate in 1791, full academician in 1794, and librarian in 1817. He died in London on April 27, 1834.

STOUGHTON, a post village of Norfolk county, Mass., about nineteen miles from Boston, on the Old Colony railroad, at the terminus of the Stoughton branch of the Boston and Providence road. It has four churches, two weekly papers, a high school, and manufactures of boots and shoes, knit and woolen goods, awls, lasts, paper boxes, bonnet frames and screens. The population in 1890 was stated at 4,850.

STOURBRIDGE, a market-town of Worcestershire, England, four miles southwest of Dudley and ten west of Birmingham. The town possesses a corn exchange, a mechanics' institute, an Edward VI. grammar school, a government school of art, and a blue-coat or hospital school. The manufacture of glass was established in 1556, by emigrants from Hungary, the place where they erected their manufactory being still known as Hungary Hill. Valuable fire-clay is obtained in the neighborhood, and a great variety of fine bricks are made. There are also large iron and leather works. The population of the urban sanitary district (area 450 acres) is 11,000.

STOVES AND FIREPLACES are structures of iron and other materials in which fuel is burned for heating and ventilating apartments and for cooking food. Following the primitive open hearth, the first separate heating apparatus used by Egyptians, Greeks, and Romans was the brazier, an open basin of metal in which charcoal was consumed. The brazier is still in common use for industrial purposes, and in Continental countries it is widely employed both for cooking and for domestic heating. The Romans further were acquainted with the hypocaust, a separate chamber under the floor of the apartment to be heated. In an improved form of hypocaust, flues were provided which conveyed the heat and products of combustion to the floors of other apartments at some distance from the fire. In the remains of Roman villas found in Britain the hypocaust is an invariable feature. The introduction of chimneys into houses in the early part of the fourteenth century opened the way to all modern improvements in the heating arrangements of apartments, and the efforts of inventors have been devoted to the securing of the thorough combustion of the fuel used, and to the utilization of the maximum amount of heat therefrom in the most healthful and agreeable manner. Compare SMOKE ABATEMENT.

The stove, or close range, as distinguished from the open fireplace, distributes the largest amount of heat from the fuel it burns. In its simplest form the common stove consists of a case of iron, closed above, with its sole raised from the floor on which it stands. It has two small openings on one side, one on the level of the fire-bars for draught, and the other above for supplying fuel; and on the opposite side the products of combustion are carried away by a flue-pipe passing into a chimney. In a more complex form the height of the body or case is increased, and a series of horizontal flues or spaces are formed inside, through which the heated air and smoke pass, thus extracting more thoroughly the heat before it enters the chimney, and giving a greatly increased heating surface. Such stoves overdry the air in rooms, and, when they are externally heated to a high degree, floating particles are burned by falling on their surfaces, whence arises the disagreeable, stuffy smell almost inseparable from their use. To mitigate this evil of overheating, linings of tiles, firebricks, and other non-conducting materials are with great advantage introduced between the heated iron and the air of the apartment. Cooking stoves or ranges have in their center a fire space covered above with a removable top-plate, in which are circular openings whereby the cooking vessels can be brought into direct contact with the fire. At both sides there are one or more compartments which form ovens, and around these the heat from the fire is carried by flues; or at one side a water boiler may be placed, although generally a high-pressure boiler occupies a space immediately behind the fire. The flues which pass around all these spaces, and that also leading directly to the chimney, are controlled by dampers, so that the heat can be directed along any desired course.

Both as a heating and cooking agent coal gas is now being largely used, and many forms of stoves have been devised to meet its peculiar conditions as a gaseous fuel. Gas stoves present the obvious advantages of cleanliness, comparative freedom from smoke, and immediate readiness for use; and the flame and heat are under the most perfect control. Gas is used in open fireplaces as well as in stoves. Small lamp stoves for burning mineral oils are also in use; but they share the serious disadvantage of certain simple gas stoves, from which the whole products of combustion pass into the room in which they are placed.

Fireplaces are entirely open in front; they radiate heat into the apartment; and flame, smoke, etc., pass directly into the chimney. The rapid passage of the heated air into the chimney carries away a large proportion of the heat, and this loss is particularly great in grates made entirely of iron. In modern grates of good quality the sides and back of the fire-basket are of fire-brick, which retains and throws out much heat. In low-combustion grates the fire-basket is set low on the hearth, and air is admitted to the fuel only through the fire-bars in front. The back of the grate slopes in toward the hearth, where the fire space is comparatively narrow. By means of a door sliding down over the front from the upper part of the grate, the indraught of air can be modified at pleasure. In ventilating fireplaces the fire-basket is of iron lined with fire-brick, and in the space between the back of the grate and the wall flues are formed which are heated from the fire. Into these flues air from without is introduced, which, after being there warmed, passes into the apartment at suitable openings.

STOW, JOHN, historian and antiquary, was born in London in 1525. His first publication was *A Summary of Englische Chronicles* in 1561, which was frequently reprinted, with slight variations, during his lifetime. Of the first edition a copy was said to have been at one time in the Grenville library. In the British museum there are at present copies of the editions of 1567, 1573, 1587, 1590, 1598, and 1604. In 1580 Stow published his *Annales, or a Generale Chronicle of England from Brute until the present yeare of Christ 1580;* it was reprinted in 1592, 1601, and 1605, the last being continued to March 26, 1605, or within ten days of his death; editions "amended" by Howes appeared in 1615 and 1631. The work by which Stow is best known is his *Survey of London*, published in 1598, not only interesting from the quaint simplicity of its style and its amusing descriptions and anecdotes, but of unique value from its minute account of the buildings, social condition, and customs of London in the time of Elizabeth. Stow died April 6, 1605.

STOWELL, WILLIAM SCOTT, BARON, one of the ablest and most accomplished of English judges, especially in international law, was born at Newcastle, October 17, 1745. His father was a "coalfitter" (or tradesman engaged in the transport of coal); his mother was the daughter of a small tradesman, Atkinson by name; his younger brother John became the famous Lord Chancellor ELDON, (*q.v.*) Scott was educated at the Newcastle grammar school. In February, 1761, he gained a Durham scholarship at Corpus Christi College, Oxford, and was immediately admitted as a student of the university. In 1764 he graduated as bachelor of arts, and became tutor of University College. In 1779 he graduated as doctor of civil law, and, after the customary "year of silence," commenced practice in the ecclesiastical courts. His professional success was rapid. In 1783 he became registrar of the Court of Faculties, and in 1788 judge of the Consistory Court and advocate-general, in that year too receiving the honor of knighthood; and in 1798 he was made judge of the High Court of Admiralty. Sir William Scott twice contested the representation of Oxford university—in 1780 without success, but successfully in 1801. He also sat for Downton in 1790. Upon the coronation of George IV. (1821) he was raised to the peerage as Baron Stowell. After a life of distinguished judicial service Lord Stowell retired from the bench—from the Consistory Court in August, 1821, and from the High Court of Admiralty in December, 1827. His mental faculties became gradually feebler in his old age, and he died on January 28, 1836.

STRABISMUS. See SQUINT.

STRABO, the famous geographer and historian, was born at Amasea in Pontus, a city which had been Hellenized to a great extent. Of his father's family we know nothing; but several of his mother's relations, who were probably Greeks, had held important posts under Mithradates Euergetes and his famous son Mithradates Eupator. Dorylaus, a distinguished general of

Mithradates Euergetes, was the great-grandfather of Strabo's mother.

Though the exact date of Strabo's birth is unknown, a close approximation is possible. Clinton places it not later than 54 B.C. The most probable date lies between 64 and 62. He received a good education in the Greek poets, especially Homer; he studied at Nysa under the grammarian Aristodemus, under Tyrannio the grammarian at Rome, under the philosopher Xenarchus either at Rome or Alexandria, and he had studied Aristotle along with Boethus (possibly at Rome under Tyrannio, who had access to the Aristotelian writings in Sulla's library). He was at Corinth in 29 B.C., where he saw Octavian on his return from Egypt to celebrate his triumph for Actium. He was in Egypt in 24 B.C., and took the opportunity of ascending the Nile in company with the prefect Ælius Gallus. He was at Rome after 14 A.D., for he describes (v. 236) as an eyewitness the place where the body of Augustus was burnt in the Campus. He was still writing in 21 A.D. The date of his death is unknown.

His earliest writings were two (not one, as commonly stated) historical works now lost, which he himself describes (xi. 515) as his *Historical Memoirs* and his *Continuation of Polybius.* There can be no doubt but that these were two distinct works; for he speaks (ii. 70) of having treated of the exploits of Alexander in his *Memoirs*, a topic which could not have found a place in a work which began where that of Polybius ended, (146 B.C.) According to Suidas, the continuation of Polybius was in forty-three books. Plutarch, who calls him "the Philosopher," quotes Strabo's *Memoirs* (*Luc.*, 28), and cites him as an historian (*Sulla*, 26). Josephus, who constantly calls him "the Cappadocian," often quotes from him, but does not mention the title of the work.

The *Geography* is the most important work on that science which antiquity has left us. It was, as far as we know, the first attempt to collect all the geographical knowledge at the time attainable, and to compose a general treatise on geography. The work consists of seventeen books, of which the seventh is imperfect. The first two books form a general introduction; the next ten deal with Europe, the four following with Asia, and the last with Africa. The first two books are meant to comprise a general survey of the progress of geography from the earliest times down to his own day. Unmethodical though they are, we owe to these books almost all we know of the geographical systems of his predecessors, especially that of Eratosthenes.

STRADELLA, ALESSANDRO, composer, singer, and performer on various instruments, was one of the most accomplished Italian musicians of the seventeenth century. The generally accepted statement that he was born at Naples about 1645 rests upon no trustworthy foundation; and the few biographical notices that we possess savor so strongly of romance that we can only be said to know him truly through his works, which show extraordinary genius, and have exercised a highly beneficial influence upon Italian art. He is said to have been assassinated about 1670.

STRADIVARIUS. See VIOLIN.

STRAFFORD, THOMAS WENTWORTH, EARL OF, was born in 1593 in London. He was educated at St. John's College, Cambridge, and in 1611 was knighted, and married Margaret, daughter of Francis, earl of Cumberland. In 1614 he represented Yorkshire in the Addled Parliament, but, as far as is now known, it was not till the parliament of 1621 that he took part in the debates. He was what, in modern times, would be called a reformer, and in those days a reformer was necessarily an upholder of the authority of the crown, in whose service the most experienced statesmen might be expected to be found, while the members of a House of Commons only summoned at considerable intervals would be deficient in the qualities necessary for undertaking successful legislation. On the other hand, James' conduct of the diplomatic struggle with Spain was not such as to inspire confidence, and Wentworth's bearing was therefore marked by a certain amount of hesitation.

In 1622 Wentworth's wife died, and in February, 1625, he married Arabella Holles, the daughter of the earl of Clare. Of the parliament of 1624 he had not been a member, but in the first parliament of Charles I. he again represented Yorkshire, and at once marked his hostility to the proposed war with Spain by supporting a motion for an adjournment before the House proceeded to business. His election was declared void, but he was reëlected. When he returned to parliament he took part in the opposition to the demand made under the influence of Buckingham for war subsidies, and was consequently, after the dissolution, made sheriff of Yorkshire, in order to exclude him, as hostile to the court, from the parliament which met in 1626. After the dissolution of that parliament he was dismissed from the justiceship of the peace and the office of *custos rotulorum* of Yorkshire.

Wentworth's position was very different from that of the regular opposition. He was anxious to serve the crown, but he disapproved of the king's policy. In January, 1626, he had asked for the presidency of the Council of the North, and had visited and made overtures to Buckingham. His subsequent dismissal was probably the result of his resolution not to support the court in its design to force the country to contribute money without a parliamentary grant. At all events, he refused in 1627 to contribute to the forced loan, and was placed in confinement in Kent for his refusal.

On July 22, 1628, Wentworth was created Lord Wentworth, and received a promise of the presidentship of the Council of the North at the next vacancy. Even on political matters he had never been quite at unison with the parliamentary opposition, and in church matters he was diametrically opposed to them. Since the close of the discussion on the Petition of Right, church matters had come into greater prominence than ever, and Wentworth was therefore thrown strongly on the side of Charles, from whom alone opposition to Puritanism could possibly come. This attachment to Charles was doubtless cemented by Buckingham's murder.

As yet Wentworth took no part in the general government of the country. In December he became Viscount Wentworth and president of the Council of the North. In the speech delivered at York on his taking office he announced his intention of doing his utmost to bind up the prerogative of the crown and the liberties of the subject in indistinguishable union.

The session of 1629 ended in a breach between the king and the parliament which made the task of a moderator hopeless. Wentworth had to choose between helping a Puritan House of Commons to dominate the king and helping the king to dominate a Puritan House of Commons. He chose the latter course, and he threw himself into the work of repression with characteristic energy, as if the establishment of the royal power was the one thing needful.

In November, 1629, Wentworth became a privy councilor. In October, 1631, he lost his second wife, and in October, 1632, he married Elizabeth Rhodes. In January, 1632, he had been named lord-deputy of Ireland, having performed his duties at York to the king's satisfaction, though he had given grave offense to the northern gentry by the enforcement of his authority. It was a cardinal point of his system that no wealth or station should exempt its possessor from obedience to the king.

In Ireland Wentworth would have to deal with a people which had not arrived at national cohesion, and among which had been from time to time introduced English colonists, some of them, like the early Norman settlers, sharing in the Catholicism of the natives, while the later importations stood aloof and preserved their Protestantism. There was also a class of officials of English derivation, many of whom failed to reach a high standard of efficiency. Against these Wentworth, who arrived in Dublin in July, 1633, waged war sometimes with scanty regard to the forms of justice, as in the case of Lord Mountnorris, whom he sent before a court-martial on a merely formal charge, which necessarily entailed a death sentence, not because he wanted to execute him, but because he knew of no other way of excluding him from official life.

In 1634 he called a parliament at Dublin, and obtained from it a considerable grant, as well as its coöperation in a remarkable series of legislative enactments. The king, however, had previously engaged his word to make certain concessions known as the "graces," and Wentworth resolved that some of these should not be granted, and took upon himself to refuse what his master had promised. The money granted by parliament, however, would not last forever, and Wentworth resolved to create a balance between revenue and expenditure before the supply was exhausted. This he succeeded in doing, partly by making a vast improvement in the material condition of the country, and partly by the introduction of monopolies and other irregular payments, which created wide dissatisfaction, especially among the wealthier class.

He resolved on pouring English colonists into Connaught as James had poured them into Ulster. To do this he had taken upon himself to set at naught Charles' promise that no colonists should be forced into Connaught, and in 1635 he proceeded to that province, where, raking up an obsolete title, he insisted upon the grand juries in all the counties finding verdicts for the king. One only, that of Galway, resisted, and the confiscation of Galway was effected by the Court of Exchequer, while he fined the sheriff $5,000 for summoning such a jury, and cited the jurymen to the castle chamber to answer for their offense. He had succeeded in setting all Ireland against him.

High-handed as Wentworth was by nature, his rule in Ireland made him more high-handed than ever. As yet he had never been consulted on English affairs, and it was only in February, 1637, that Charles asked his opinion on a proposed interference in the affairs of the Continent. In reply, he assured Charles that it would be unwise to undertake even naval operations till he had secured absolute power at home. The opinion of the judges had given the king the right to levy ship-money, but, unless his Majesty had "the like power declared to raise a land army, the crown seemed to stand upon one leg at home, to be considerable but by halves to foreign princes abroad." The power so gained indeed must be shown to be beneficent by the maintenance of good government, but it ought to exist. A beneficent despotism supported by popular gratitude was now Wentworth's ideal.

In September, 1639, after Charles' failure in the first Bishops' War, Wentworth arrived in England to conduct in the star-chamber a case in which the Irish chancellor was being prosecuted for resisting the deputy. From that moment he stepped into the place of Charles' principal adviser. Ignorant of the extent to which opposition had developed in England during his absence, he recommended the calling of a parliament to support a renewal of the war, hoping that by the offer of a loan from the privy councilors, to which he himself contributed $100,000, he would place Charles above the necessity of submitting to the new parliament if it should prove restive. In January, 1640, he was created earl of Strafford, and in March he went to Ireland to hold a parliament, where the Catholic vote secured a grant of subsidies to be used against the Presbyterian Scots. An Irish army was to be levied to assist in the coming war. When in April Strafford returned to England he found the Commons holding back from a grant of supply, and tried to enlist the peers on the side of resistance. On the other hand, he attempted to induce Charles to be content with a smaller grant than he had originally asked for. The Commons, however, insisted on peace with the Scots, and on May 9th, at the privy council, Strafford, though reluctantly, voted for a dissolution.

After this Strafford supported the harshest measures. He urged the king to invade Scotland, and, in meeting the objection that England might resist, he uttered the words which cost him dear, "You have an army in Ireland you may employ here to reduce this kingdom." He tried to force the citizens of London to lend money. He supported a project for debasing the coinage and for seizing bullion in the Tower, the property of foreign merchants. He also advocated the purchasing a loan from Spain by the offer of a future alliance. He was ultimately appointed to command the English army, but he was seized with illness, and the rout of Newburn made the position hopeless. In the great council at York he showed his hope that if Charles maintained the defensive the country would still rally round him, while he proposed, in order to secure Ireland, that the Scots of Ulster should be ruthlessly driven from their homes.

When the Long Parliament met it was preparing to impeach Strafford, when tidings reached its leaders that Strafford, now lord-lieutenant of Ireland, had come to London and had advised the king to take the initiative by accusing his chief opponents of treason. On this the impeachment was hurried on, and the Lords committed Strafford to the Tower. At his trial in Westminster Hall he stood on the ground that each charge against him, even if true, did not amount to treason, while Pym urged that, taken as a whole, they showed an intention to change the government, which in itself was treason. Undoubtedly the project of bringing over the Irish army, probably never seriously entertained, did the prisoner most damage, and when the Lords showed reluctance to condemn him the Commons dropped the impeachment and brought in a bill of attainder. The Lords would probably have refused to pass it if they could have relied on Charles' assurance to relegate Strafford to private life if the bill were rejected. Charles unwisely took part in projects for effecting Strafford's escape and even for raising a military force to accomplish that end. The Lords took alarm and passed the bill. On May 9, 1641, the king, frightened by popular tumults, reluctantly signed a commission for the purpose of giving to it the royal assent, and on the 12th Strafford was executed on Tower Hill.

STRAITS SETTLEMENTS, the collective name given to the British possessions in the MALAY PENINSULA (*q.v.*), derived from the straits which separate the peninsula from Sumatra and which form so important a sea-gate between India and China. The Straits Settlements are defined as consisting of the island of Singapore (which contains the seat of government), the town and province of Malacca, the territory and islands of the Dindings (off Perak), the island of Penang, and

Province Wellesley, with their dependencies actual or prospective. The Cocos or KEELING ISLANDS (*q.v.*), formerly attached to Ceylon, were transferred to the Straits Settlements in 1886. These possessions have formed a crown colony since 1867, previous to which they were administered as a presidency of the Indian empire. The governor, appointed for six years, is assisted by an executive and a legislative council. Resident councilors are stationed at Penang and Malacca, and since 1874 British residents have exercised supervision at the native courts of Perak, Selangor, and Sungei Ujong, and are assisted by a staff of European officials.

The population, which was 306,775 in 1871 and 423,384 in 1881, was estimated at 473,000 in 1884. The increase is solely produced by immigration of Chinese and natives of India; for, while the total number of births registered in Singapore, Penang, Province Wellesley, and Malacca was in the three years 1881–83 only 21,134, the deaths were 37,151. In 1883 61,206 Chinese landed at Singapore and 48,419 in Penang; and, though the influx of Indian coolies has been retarded by the stringent protective laws of the Indian government, the stream of immigration has been steadily increasing in volume. The number of Chinese is probably below the truth, as they were very reluctant to fill up the returns. In 1867, the date of the transfer to the crown, the colony had, it was estimated, not more than 283,384 inhabitants.

MALACCA.—The territory of Malacca lies between the river Linggi and the Kesang, which separate it respectively from Sungei Ujong to the northwest and the Moar district of Johor to the east. To the north it marches with Negri Sembilan. The city of Malacca has already been described.

PRINCE OF WALES ISLAND (or Penang) and SINGAPORE are treated in separate articles.

PROVINCE WELLESLEY, which lies opposite Penang, was at one time part of the Kedah territory, from which it is now separated by the Kwala Muda river. Southward it extends (since 1874) a little to the south of the Krian river and marches with Perak. The boundary was rectified by treaty with Siam in 1867. Butterworth is the seat of the government headquarters. Sugar-growing has long been a staple industry, and tea plantations began to be formed in 1869–70.

THE DINDINGS belonged originally to the state of Perak. The British territory extends some twenty-six miles from north to south.

PERAK is an extensive tract of country, comprising the great part of the basin of the Perak river (which runs north and south, almost parallel with the coast of the peninsula, for upward of 130 miles, excluding the windings, before it turns abruptly west to the strait) and all the basin of the Bernam river. The boundary toward Patani cuts the Perak river at the rapids of Jeram Panjang. The population of the states is about 110,000, among the more noteworthy tribes being the Sakeis. Perak was brought into closer relation to Britain by the treaty signed at Pankor (Pangkore) in the Dindings, January 20, 1874, which authorized the appointment of a British resident and assistant resident.

SELANGOR lies to the south of Perak, and consists mainly of the basins of the Selangor, the Klang, and the Langat, of which the last two meet in a common delta to the south of 3° N. latitude. Previous to 1880 the seat of the British resident and staff was at Klang, at the head of thirteen-feet navigation on the Klang river; at that date it was transferred to Kwala Lumpur, at the junction of the Gombah with the Klang, the highest point reached by the cargo boats which bring up provisions for the tin-miners and return with tin, gutta-percha, and other produce. There are tin-mining settlements at Kanching, Ulu Selangor, Ulu Bernam, Ulu Gombah, Ulu Klang, Ulu Langat, Sungie Pateh Recko, Kajang, Ampagnan, etc. The population of Selangor (50,000—29,000 of them Chinese) is rapidly increasing by immigration from China, India, and Sumatra. Since the close of the civil war (1867–74) and the acceptance of the British resident the country has rapidly developed.

SUNGEI UJONG (500 square miles, including Lukut and Sungei Riah; population, 14,000, the greater part being Chinese) also shows steady progress. European coffee and cocoa plantations, and Chinese tapioca, pepper and gambier plantations are cultivated.

STRALSUND, a seaport and small manufacturing town in Western Pomerania, Prussia, is situated on the Strelasund, an arm of the Baltic Sea, 115 miles to the north of Berlin, and 85 miles to the northwest of Stettin. The position of the town on a small triangular islet, only connected with the mainland by moles and bridges at the angles, has always rendered its fortification comparatively easy, and down to 1873 it was a fortress of the first rank. The three vast Gothic churches of St. Nicholas, St. Mary, and St. James, erected in the fourteenth and fifteenth centuries, and the town-house, dating in its oldest part from 1316, are among the more striking buildings. The public library, founded in 1709, contains 60,000 volumes. The manufactures of Stralsund are more miscellaneous than extensive; they include machinery, beer, oil, paper, playing-cards, and sugar. The population in 1880 was 29,481, in 1885, 28,981.

STRANGE, SIR ROBERT, an eminent line engraver, was born in the Mainland of Orkney, on July 14, 1721. In his youth he spent some time in an attorney's office; but, having manifested a taste for drawing, he was apprenticed, in 1735, to Richard Cooper, an engraver in Edinburgh. After leaving Cooper in 1741, he started on his own account as an engraver, and had attained a fair position when, in 1745, he joined the Jacobite army as a member of the corps of life guards. He engraved a half-length of the Young Pretender, and also etched plates for a bank-note designed for the payment of the troops. He was present at the battle of Culloden, and after the defeat remained in hiding in the Highlands, but ultimately returned to Edinburgh.

In the following year he proceeded to Rouen, and there studied drawing under J. B. Descamps, carrying off the first prize in the Academy of Design. In 1749 he removed to Paris, and placed himself under the celebrated Le Bas. It was from this master that he learned the use of the dry point, an instrument which he greatly improved, and employed with excellent effect in his own engravings. In 1750 Strange returned to England. He settled in London, and superintended the illustrations of Dr. William Hunter's great work on the *Gravid Uterus*, published in 1774. The plates were engraved from red chalk drawings by Van Rymsdyk, now preserved in the Hunterian Museum, Glasgow, and two of them were executed with great skill by Strange's own hand. By his plates of the Magdalen and Cleopatra, engraved after Guido in 1753, he at once established his professional reputation.

In 1760 Strange started on a long-meditated tour in Italy. He studied in Florence, Naples, Parma, Bologna, and Rome, executing innumerable drawings, of which many—the *Day* of Correggio, the *Danae* and the *Venus and Adonis* of Titian, the *St. Cecilia* of Raphael, and the *Barberini Magdalen* of Guido, etc.—were afterward reproduced by his burin. On the Continent he was received with great distinction, and he was elected a member of the academies of Rome, Florence, Parma, and

Paris. He left Italy in 1764, and, having engraved in the French capital the *Justice* and the *Meekness* of Raphael, from the Vatican, he carried them with him to London in the following year.

The rest of his life was spent in the diligent prosecution of his art. In 1766 he was elected a member of the Incorporated Society of Artists. He died in London on July 5, 1792.

STRANRAER, a royal burgh of Wigtownshire, Scotland, is situated on the North Channel, at the head of Loch Ryan, seven and one-half miles northeast of Portpatrick, and fifty-nine miles south-southwest of Ayr. In the center of the town is the old baronial castle of the fifteenth century occupied by Claverhouse when he held the office of sheriff of Galloway. The principal public buildings are the old town-hall, the new town-hall and court-house (1873), and the academy (1845). The population of the royal burgh (area fifty-five acres) is 3,455, and of the police burgh 6,342.

STRASBURG (Germ. *Strassburg*, Fr. *Strasbourg*), the principal town of Alsace, and a fortress of the first rank, is situated at the junction of the Ill and the Breusch, about two miles to the west of the Rhine, in one of the most fertile districts in the upper Rhenish plain. It lies about ninety miles to the north of Basel, 250 miles to the east of Paris, and 370 miles to the southwest of Berlin. Since 1871 it has been the seat of government for the German crownland of Alsace-Lorraine (Elsass-Lothringen); and it is also the see of a Roman Catholic bishop and the headquarters of the fifteenth corps of the German army. The town proper is divided by the arms of the Ill into three parts, of which the central is the largest and most important. Most of the streets are narrow and irregular, and the quaint aspect of a free mediæval town has to a considerable extent been maintained. The quarters which suffered most in the bombardment of 1870, have, however, been rebuilt in a more modern fashion, and the recent widening of the circle of fortifications, with the destruction of the old walls, has given the city opportunity to expand in all directions.

By far the most prominent building is the minster, or cathedral, which in its present form represents the activity of four centuries. Part of the crypt dates from about 1015; the apse shows the transition from the Romanesque to the Gothic style; and the nave, finished in 1275, is a fine specimen of pure Gothic. The intricate open-work spire on the north tower, 465 feet high, was added in 1435. The sculptural ornamentation both without and within is very rich. The astronomical clock in the south transept, constructed in 1838–42, contains some fragments of the famous clock built by Dasypodius in 1571. The church of St. Thomas, a Gothic building of the thirteenth and fourteenth centuries, contains a fine monument to Marshal Saxe, considered the *chef d'œuvre* of the sculptor Pigalle.

The university and town library, containing about 600,000 volumes, consists largely of the books sent from all parts of Germany to compensate for the town library destroyed in the bombardment of 1870. The precious incunabula and manuscripts which then perished are, however, irreplaceable. General Kleber, who was a native of Strasburg, and Gutenberg, who spent part of his life here, are both commemorated by statues. Many private houses are most quaint and interesting illustrations of timber architecture. Pleasant public parks and gardens fringe the town.

The population in 1880 was 104,471, including 51,859 Roman Catholics, 48,691 Protestants, and 3,521 Jews. In 1885 the total population had risen to 112,091, showing an increase of 7.29 per cent. The town, strictly so called, does not contain more than 90,000 inhabitants, the rest belonging to the suburban villages. Even before the war of 1870–71 more than half of the inhabitants spoke German as their mother-tongue, and this proportion has probably been somewhat increased since. The sympathies of the people, however, like those of most of the Alsatians, lay with France, and it will require the growth of a new generation to bring about a complete reconciliation to German rule.

The chief industries of Strasburg are tanning, brewing, and the making of steel goods, machinery, and tobacco. To these must be added the stall-fattening of geese for its celebrated *pâtés de foie gras*, an occupation which forms a most useful source of income to the poorer classes. The annual value of these "fat liver pies" sent out from Strasburg is over $500,000. The position of the town at the intersection of natural highways between France and Germany, Switzerland and Belgium, early made it a place of considerable commercial importance, and it now carries on a brisk trade in agricultural produce, hams, sausages, sauerkraut, and hops. Its full development in this direction, though favored by the canals connecting the Rhine with the Rhone and the Marne, has been somewhat hampered by the iron girdle of fortifications. It was at Strasburg that Louis Napoleon made his first ineffectual attempt to grasp power. In the war of 1870 Strasburg, with its garrison of 17,000 men, surrendered to the Germans after a siege of seven weeks. The town and cathedral suffered considerably from the bombardment, but all traces of the havoc have now disappeared.

STRASS, or Paste. See Glass.

STRATEGY. See War.

STRATFORD, usually designated Stratford-on-Avon, a market-town and municipal borough of England, in Warwickshire, is pleasantly situated on the Avon, twenty-six miles south of Birmingham and eight southwest of Warwick. The Avon is crossed by a stone bridge of fourteen arches, built by Sir Hugh Clopton in the reign of Henry VII., and widened in 1814; by a bridge of nine arches, built of brick in 1826; and by a foot-bridge erected in 1867. The streets are wide and regular, crossing each other generally at right angles, and, says J. O. Halliwell-Phillipps, "with the exception of a few diffused buildings, scarcely one of which is in its original condition, there is no resemblance between the present town and the Shakespearean borough" (compare article Shakespeare). The church of the Holy Trinity occupies the site of a Saxon monastery, which existed before 691, when the bishop of Worcester received it in exchange from Ethelred, king of Mercia. It is a fine cruciform structure, partly Early English and partly Perpendicular, with a central tower and lofty octagonal spire. It was greatly improved in the reign of Edward III. by John de Stratford, who rebuilt the south aisle. The present beautiful choir was built by Dean Balshall (1465–91), and in the reign of Henry VII. the north and south transepts were erected. The mural monument of Shakespeare, who is buried in the chancel, is of special interest from its effigy of the poet. undoubtedly an authentic representation, though somewhat altered and damaged by time.

The house in which Shakespeare was born still stands—although its external appearance is much altered—and an apartment is by immemorial tradition pointed out as his birth-room. In 1597 Shakespeare purchased New Place for his residence. Shakespeare's house was pulled down by Sir John Clopton in 1702, and the large new mansion erected on its site was pulled down by Sir Francis Gastrell in 1759. Chiefly through the exertions of J. O. Halliwell-Phillipps, the site of New Place was purchased by public subscription, and in 1876 handed over to the trustees of the birthplace. The old theater, which had occupied part of the ground, was taken down in 1872, and in 1877 a new memorial theater was erected at a cost of $150,000. The population of the borough is 9,000.

STRATFORD, a city of Ontario, in the Dominion of Canada, and capital of Perth county, is eligibly situated on the Avon river at its junction with the Buffalo division of the Grand Trunk railroad. Three additional railroads center at Stratford, which is 115 miles northwest of Buffalo and 88 miles west of Toronto, in the center of an agricultural region, among the richest and most desirable in the province of Ontario. Water power of great value is also available, and is largely employed in the conduct of many industrial enterprises, for which the city is widely known. The county buildings located at Stratford are features among the improvements made there, and the railway station is one of the most convenient and best appointed in the district. The city also contains four banks, two daily and two weekly newspapers, seven churches, stores, hotels, public halls, and many fine private residences. Distilleries and breweries are embraced among the manufactures, also flour and saw mills, iron castings, machinery, steam engines, agricultural implements, woolens, leather, boots and shoes, cigars, soap, furniture, and novelties of almost every description. The workshops in connection with the Grand Trunk system are located here, and give employment to a large force of operatives. The population of the city was estimated at 10,000 in 1890.

STRATFORD DE REDCLIFFE, Stratford Canning, Viscount, diplomatist, the first cousin of George Canning the statesman, and the youngest son of Stratford Canning, was born November 4, 1786. In 1805 he was elected scholar of King's College, Cambridge, and, while still attending the university, became in 1807 précis writer to his cousin, who had been appointed foreign minister. At the close of the year he went to Copenhagen as one of the secretaries of a special diplomatic mission, and after his return he was appointed in June, 1808, first secretary at Constantinople. On the removal of his chief, Mr. Adair, to Vienna in July, 1810, Canning remained as minister plenipotentiary. In 1812 he succeeded in effecting the treaty of Bucharest between Russia and Turkey, which was signed on May 12th, shortly before the arrival of his successor. This was properly the inauguration of that English influence in Turkey which did not cease until within recent years.

In May, 1814, he was appointed by Lord Castlereagh minister plenipotentiary to Switzerland, where he succeeded in effecting the federation of the cantons as a neutral state. He returned to England in 1817, and in August, 1820, was sent as plenipotentiary to the United States, to arrange certain outstanding differences between the States and England; but, although a convention was signed, March 13, 1824, this was rejected by the American senate, and matters for several years remained, so far as any actual arrangement was concerned, *in statu quo*. In October, 1825, Canning was sent on a second commission to Constantinople, chiefly to promote the independence of Greece, but after long and complicated negotiations the attack, without the knowledge of the ambassadors, on the Turkish fleet by the allies under Sir E. Codrington at Navarino, October 20, 1827, caused a conference then being held to be suddenly broken up, and rendered necessary the withdrawal of the ambassadors from Constantinople. They, however, again met at Poros toward the close of the following year, and ultimately Turkey was compelled, by the treaty of Adrianople, August 14, 1829, following a short war with Russia, to loose her grasp on Greece, and consent to the arrangement of a frontier limit. On his return to England Canning was made G.C.B. In 1828 he had been elected to the House of Commons for Old Sarum, and he sat for different boroughs until 1841, when he again accepted the office of ambassador to Turkey. During the next twelve years he gradually succeeded in winning the confidence of the sultan, as well as awakening his wholesome awe, by convincing him, not merely of his sincere interest in the welfare of Turkey, but of his sole ability to thwart the wiles of the Russian emperor. During the Crimean War he retained his position at Constantinople, but at its conclusion he returned, in 1858, to London. In 1852 he had been raised to the peerage with the title Viscount Stratford de Redcliffe. He died August 14, 1880.

STRATO. See Peripatetics.

STRAUBING, an ancient town in the most fertile part of Lower Bavaria, is situated on the right bank of the Danube, twenty-five miles to the southeast of Ratisbon. Its oldest and most characteristic building is the tall square tower of the town-hall, with its five pointed turrets, dating from 1208. The population is 12,625, nearly all Roman Catholics.

STRAUSS, David Friedrich, author of the *Leben Jesu*, was born at Ludwigsburg, near Stuttgart, January 27, 1808. In his thirteenth year the boy was sent to the evangelical seminary at Blaubeuren, near Ulm, to be prepared for the study of theology. In 1825 Strauss passed from school to the university of Tübingen. The course of study was two years of philosophy and history and three of theology. The professors of philosophy failed to interest him, and he accordingly followed pretty much his own devices in this field, devoting himself especially to Schelling, the writers of the romantic school, Jacob Böhme, and even to somnambulistic and other modern superstitions.

In 1830 he passed his examination brilliantly, and became assistant to a country clergyman, and was greatly beloved as preacher and pastor by the parishioners. After nine months in this position he accepted the post of professor in the high school at Maulbronn, having to teach Latin, history, and Hebrew. Here also he was most successful and highly valued. But in October, 1831, he resigned his office in order to study under Schleiermacher and Hegel in Berlin. Hegel died just as he arrived, and, though he regularly attended Schleiermacher's lectures, it was only those on the life of Jesus which exercised a very powerful influence upon him. It was among the followers of Hegel that he found kindred spirits. Under the leading of Hegel's distinction between "Vorstellung" and "Begriff," he had already conceived the idea of his two principal theological works—the *Life of Jesus* and the *Christian Dogmatics*. In 1832 he returned to Tübingen and became repetent in the university, lecturing on logic, history of philosophy, Plato, and history of ethics, with great success. But in the autumn of 1833 he resigned this position in order to devote all his time to the completion of his projected *Life of Jesus*. In a year the manuscript was finished, and in 1834 the first volume, and in 1835 the second were given to the world. The work produced an immense sensation and created a new epoch in the treatment of the rise of Christianity. With his *Glaubenslehre* he took leave of theology for upward of twenty years. In 1848 he was nominated as member of the Frankfort parliament, but was defeated. He was elected for the Würtemberg chamber, but his action was so conservative that his constituents requested him to resign his seat. He forgot his political disappointments in the production of a series of biographical works, which secured for him a permanent place in German literature. He died February 7, 1874.

STRAUSS, Johann, orchestral conductor and composer of dance-music, was born at Vienna, March 14, 1804. In 1819 he obtained his first engagement as a violinist in a small band then playing at the Sperl, in the Leopoldstadt. Shortly afterward he joined Lanner, with whom he remained associated as deputy-conductor until 1825. It was during the carnival of 1826 that Strauss inaugurated his long line of triumphs by introducing his band to the public of Vienna at the Schwan, in the Rossau suburb, where his famous *Taüberl-Walzer* (op. 1) at once established his reputation as the best composer of dance-music then living. Soon after this he was appointed kapellmeister to the first Bürger regiment, and intrusted with the duty of providing the music for the court balls; while the number of his private engagements was so great that he found it necessary to enlarge his band from time to time until it consisted of more than two hundred performers. In 1833 he began a long and extended series of tours throughout northern Europe, eventually visiting England in 1838. In Paris he associated himself with Musard, whose quadrilles became not much less popular than his own waltzes; but his greatest successes were achieved in London. In 1844 Strauss began another extensive series of tours. In 1849 he revisited London, and on his return to Vienna he was attacked with scarlet fever, of which he died September 25, 1849.

STRAUSS-DURCKHEIM, Hercule, born 1790, died 1865, an eminent French entomologist, was the author of anatomical works of exquisite precision and fullness of detail. Two of these (his monographs of the anatomy of the cockchafer and of the cat) are permanent classics, of which the influence has aided greatly in raising the standard of zoölogical works.

STRAWBERRY (*Fragaria*). Apart from its interest as a dessert fruit (see Horticulture), the strawberry has claims to attention by reason of the peculiarities of its structure and the excellent illustrations it offers of the inherent power of variation possessed by the plant, and of the success of the gardener in availing himself of this tendency. The genus *Fragaria* consists of a small number (three to four, according to Hooker) of species, native of the temperate regions of both hemispheres, as well as of mountain districts in warmer climes. The tufted character of the plant, and its habit of sending out long slender branches (runners) which produce a new bud at the extremity, are well known. The leaves are usually palmately three-parted, but the number of leaflets may be increased to five or reduced to one. While the flower has the typical Rosaceous structure, the so-called fruit is very peculiar, but it may be understood by the contrast it presents with the "hip" of the rose. In the last-named plant the top of the flower-stalk expands as it grows into a vase-shaped cavity, the "hip," within which are concealed the true fruits or seed-vessels. In the rose the extremity of the floral axis is concave, and bears the carpels in its interior. In the strawberry the floral axis, instead of becoming concave, swells out into a fleshy, dome-shaped or flattened mass in which the carpels or true fruits, commonly called pips or seeds, are more or less imbedded, but never wholly concealed. A ripe strawberry in fact may be aptly compared to the "fruit" of a rose turned inside out.

The common wild strawberry, which is found throughout Europe and great part of North America, is *F. vesca*, and this was the first species brought under cultivation in the early part of the seventeeth century. Later on other species were introduced, such as *F. elatior*, a European species, the parent stock of the hautbois strawberries, and especially *F. virginiana* from the United States and *F. chiloensis* from Chiloe. From these species, crossed and recrossed in various manners, have sprung the vast number of different varieties now enumerated in catalogues, whose characteristics are so inextricably blended that the attempt to trace their exact parentage or to follow out their lineage has become impossible. It must suffice to say that the varieties at present cultivated vary in the most remarkable degree in size, color, flavor, shape, degree of fertility, season of ripening, liability to disease, and constitution of plant. Some, as previously stated, vary in foliage, others produce no runners, and some vary materially in the relative development of their sexual organs, for, while in most cases the flowers are in appearance hermaphrodite, at least in structure, there is a very general tendency toward a separation of the sexes, so that the flowers are males or females only as to function, even although they may be perfect in construction.

STRAW MANUFACTURES. Straw forms the raw material of some important industries. It serves for the thatching of roofs, for a paper-making material, for ornamenting small surfaces as a "straw mosaic," for plaiting into door and table mats, mattresses, etc., and for weaving and plaiting into light baskets, artificial flowers, etc. These applications, however, are insignificant in comparison with the place occupied by straw as a raw material for the straw bonnets and hats worn by both sexes. Of the various materials which go to the fabrication of plaited head-gear the most important is wheaten straw. It is only in certain areas that straw suitable for making plaits is produced. The straw must have a certain length of "pipe" between the knots, must possess a clear, delicate golden color, and must not be brittle. The most valuable straw for plaits is grown in Tuscany, and from it the well-known Tuscan plaits and Leghorn hats are made. The straw of Tuscany, specially grown for plaiting, is distinguished into three qualities. The wheat-seed for these straws is sown very thickly on comparatively elevated and arid land, and it sends up long attenuated stalks. When the grain in the ear is about half developed the straw is pulled up by the roots, dried in the sun, and subsequently spread out for several successive days to be bleached under the influence of alternate sunlight and night-dews. The pipe of the upper joint alone is selected for plaiting, the remainder of the straw being used for other purposes. These pipes are made up in small bundles, bleached in sulphur fumes in a closed chest, assorted into sizes, and so prepared for the plaiters. Straw plaiting is a domestic industry among the women and young children of Tuscany and some parts of Emilia. Tuscan plaits and hats vary enormously in quality and value; the plait of a hat of good quality may represent the work of four or five days, while hats of the highest quality may each occupy six to nine months in making.

The districts around Luton in Bedfordshire and the neighboring counties have, since the beginning of the seventeenth century, been the British home of the straw-plait industry. The straw of certain varieties of wheat cultivated in that region is, in favorable seasons, possessed of a fine bright color and due tenacity and strength. The straw is cut as in ordinary harvesting, but is allowed to dry in the sun before binding. Subsequently straws are selected from the sheaves, and of these the pipes of the two upper joints are taken for plaiting.

In the United States straw-plait work is principally centered in the State of Massachusetts.

STREATOR, located on the Vermillion river in

Bruce township, La Salle county, Ill., is a city of much importance as a distributing point for the surrounding country, as also in relation to trade in contemporary cities of Illinois and States adjoining. The railway systems available here embrace the Wabash, Chicago and Alton, Chicago, Santa Fé and California, and the Chicago, Burlington and Quincy, furnishing unsurpassed facilities for receiving commodities, shipping grain, produce, etc., also in promptly meeting demands from a distance, and which with the enterprise of the people and other agencies have contributed materially to the prosperity of the vicinity. In the immediate neighborhood of Streator the Vermillion coal fields are located, giving employment to many operatives and furnishing additional capital for the commercial and manufacturing development now making. The city contains one private and two national banks, three daily and two weekly papers, also a monthly magazine, eight churches, a high school and adequate educational accommodations, two opera houses, several fine hotels, manufactories of boilers, engines, and machinery, agricultural implements, mining ventilators, ditching tools, lumber, sash, doors, and blinds, glassware, stoves, cigars, and brick. The city's population, nearly 6,000 in 1880, was 11,414 at the United States census of 1890.

STREET, GEORGE EDMUND, one of the ablest architects of the present century, was born at Woodford in Essex, England, in 1824. He obtained his architectural education in the office of Mr. Owen Carter at Winchester, and afterward worked for five years as an "improver" with Sir G. G. Scott in London. At an early age Street became deeply interested in the principles of Gothic architecture, and devoted an unsparing amount of time and labor to studying and sketching the finest examples of mediæval buildings in England and on the Continent. He was a draughtsman of a very high order; his sketches are masterpieces of spirit and brilliant touch. His largest works were the nave of Bristol cathedral, the choir of the cathedral of Christ Church in Dublin, and, above all, the new Courts of Justice in London, second only in architectural importance (during this century) to the Houses of Parliament. After a prolonged competition Street was appointed architect to the Courts of Justice in 1868; but the building was not complete at the time of his death in December, 1881. Street was elected an associate of the Royal Academy in 1866 and R. A. in 1871; at the time of his death he was professor of history to the Royal Academy, and had just finished a very interesting course of lectures on the development of mediæval architecture.

STRENGTH OF MATERIALS. The name "strength of materials" is given to that part of the theory of engineering which deals with the nature and effects of stresses in the parts of engineering structures. Its principal object is to determine the proper size and form of pieces which have to bear given loads, or conversely, to determine the loads which can be safely applied to pieces whose dimensions and arrangement are already given. It also treats of the relation between the applied loads and the changes of form which they cause. The subject comprises experimental investigation of the properties of materials as to strength and elasticity, and mathematical discussion of the stresses in ties, struts, beams, shafts, and other elements of structures and machines.

STRESS is the mutual action at the surface of contact between two bodies, or two imaginary parts of a body, whereby each of the two exerts a force upon the other. Thus, when a stone lies on the ground there is at the surface of contact a stress, one aspect of which is the force directed downward with which the stone pushes the ground, and the other aspect is the equal force directed upward with which the ground pushes the stone. A body is said to be in a state of stress when there is a stress between the two parts which lie on opposite sides of an imaginary surface of section. A pillar or block supporting a weight is in a state of stress because at any cross section the part above the section pushes down against the part below, and the part below pushes up against the part above. A stretched rope is in a state of stress, because at any cross section the part on each side is pulling the part on the other side with a force in the direction of the rope's length. A plate of metal that is being cut in a shearing machine is in a state of stress, because at the plane which is about to become the plane of actual section the portion of metal on each side is tending to drag the portion on the other side with a force in that plane.

In a solid body which is in a state of stress the direction of stress at an imaginary surface of division may be normal, oblique, or tangential to the surface. When oblique it is often conveniently treated as consisting of a normal and a tangential component. Normal stress may be either push (compressive stress) or pull (tensile stress). Stress which is tangential to the surface is called shearing stress. Oblique stress may be regarded as so much push or pull along with so much shearing stress. The amount of stress per unit of surface is called the intensity of stress. Stress is said to be uniformly distributed over a surface when each fraction of the area of surface bears a corresponding fraction of the whole stress.

The simplest possible state of stress is that of a short pillar or block compressed by opposite forces applied at its ends, or that of a stretched rope or other tie. In these cases the stress is wholly in one direction, that of the length. These states may be distinguished as simple longitudinal push and simple longitudinal pull. In them there is no stress on planes parallel to the direction of the applied forces.

A more complex state of stress occurs if the block is compressed or extended by forces applied to a pair of opposite sides, as well as by forces applied to its ends—that is to say, if two simple longitudinal stresses in different directions act together. A still more complex state occurs if a third stress be applied to the remaining pair of sides. It may be shown that any state of stress which can possibly exist at any point of a body may be produced by the joint action of three simple pull or push stresses in three suitably chosen directions at right angles to each other. These three are called principal stresses, and their directions are called the axes of principal stress. These axes have the important property that the intensity of stress along one of them is greater, and along another it is less, than in any other direction. These are called respectively the axes of greatest and least principal stress.

For any particular mode of stress the limit of elasticity is much more sharply defined in some materials than in others. When well defined it may readily be recognized in the testing of a sample from the fact that after the stress exceeds the limit of elasticity the strain begins to increase in a much more rapid ratio to the stress than before. This characteristic goes along with the one already mentioned, that up to the limit the strain is wholly or almost wholly elastic.

Beyond the limits of elasticity the relation of strain to stress becomes very indefinite. Materials then exhibit, to a greater or less degree, the property of plasticity. The strain is much affected by the length of time during which the stress has been in operation, and reaches its maximum, for any assigned stress, only after a long (probably an indefinitely long) time. Finally, when the stress is sufficiently increased, the ratio of the increment of strain to the increment of stress becomes indefinitely great if time is given for the stress to take effect. In other words, the substance then assumes what may be called a completely plastic state; it *flows* under the applied stress like a viscous liquid.

The *ultimate strength* of a material with regard to any stated mode of stress is the stress required to produce rupture. In reckoning ultimate strength, however, engineers take, not the actual intensity of stress at which rupture occurs, but the value which this intensity would have reached had rupture ensued without previous alteration of shape. Thus, if a bar whose original cross-section is two square inches breaks under a uniformly distributed pull of sixty tons, the ultimate tensile strength of the material is reckoned to be thirty tons per square inch, although the actual intensity of stress which produced rupture may have been much greater than this, owing to the contraction of the section previous to fracture. The convenience of this usage will be obvious from an example. Suppose that a piece of material of the same quality be used in a structure under conditions which cause it to bear a simple pull of six tons per square inch; we conclude at once that the actual load is one-fifth of that which would cause rupture, irrespective of the extent to which the material might contract in section if overstrained. The stresses which occur in engineering practice are, or ought to be, in all cases within the limits of elasticity, and within these limits the change of cross-section caused by longitudinal pull or push is so small that it may be neglected in reckoning the intensity of stress.

Ultimate tensile strength and ultimate shearing strength are well defined, since these modes of stress (simple pull and simple shearing stress) lead to distinct fracture if the stress is sufficiently increased. Under compression some materials yield so continuously that their ultimate strength to resist compression can scarcely be specified; others show so distinct a fracture by crushing that their compressive strength may be determined with some precision.

Some of the materials used in engineering, notably timber and wrought-iron, are so far from being isotropic that their strength is widely different for stresses in different directions. In the case of wrought-iron the process of rolling develops a fibrous structure on account of the presence of streaks of slag which become interspersed with the metal in puddling; and the tensile strength of a rolled plate is found to be considerably greater in the direction of rolling than across the plate. Steel plates, being rolled from a nearly homogeneous ingot, have nearly the same strength in both directions.

In applying a knowledge of the ultimate strength of materials to determine the proper sizes of parts in an engineering structure, these parts are proportioned so that the greatest intensity of stress (which for brevity is called the working stress) will be only a certain fraction of the ultimate strength.

From an engineering point of view, the structural merit of a material, especially when live loads and possible shocks have to be sustained, depends not only on the ultimate strength but also on the extent to which the material will bear deformation without rupture. This characteristic is shown in tests made to determine tensile strength by the amount of ultimate elongation, and also by the contraction of the cross-section which occurs through the flow of the metal before rupture. It is often tested in other ways, such as by bending and unbending bars in a circle of specified radius, or by examining the effect of repeated blows. Tests by impact are generally made by causing a weight to fall through a regulated distance on a piece of the material supported as a beam.

Ordinary tests of strength are made by submitting the piece to direct pull, direct compression, bending, or torsion. Testing machines are frequently arranged so that they may apply any of these four modes of stress; tests by direct tension are the most common.

A matter of great practical as well as scientific interest is the weakening which materials undergo by repeated changes in their state of stress. It appears that in some, if not in all materials, a limited amount of stress-variation may be repeated time after time without appreciable deterioration in the strength of the piece; in the balance-spring of a watch, for instance, tension and compression succeed each other some 150,000,000 times in a year, and the spring works for years without apparent injury. In such cases the stresses lie well within the elastic limits. On the other hand, the toughest bar breaks after a small number of bendings to and fro, when these pass the elastic limits, although the stress may have a value greatly short of the normal ultimate strength. A laborious research by Wöhler, extending over twelve years, has given much important information regarding the effects on iron and steel of very numerous repeated alternations of stress from positive to negative, or between a higher and a lower value without change of sign. By means of ingeniously contrived machines he submitted test-pieces to direct pull, alternating with complete or partial relaxation from pull, to repeated bending in one direction and also in opposite directions, and to repeated twisting toward one side and toward opposite sides. The results show that a stress greatly less than the ultimate strength (as tested in the usual way by a single application of load continued to rupture) is sufficient to break a piece if it be often enough removed and restored, or even alternated with a less stress of the same kind. In that case, however, the variation of stress being less, the number of repetitions required to produce rupture is greater. In general, the number of repetitions required to produce rupture is increased by reducing the range through which the stress is varied, or by lowering the upper limit of that range. If the greatest stress be chosen small enough, it may be reduced, removed, or even reversed many million times without destroying the piece.

Little is exactly known with regard to the effect of temperature on the strength of materials. Some metals, notably iron or steel containing much phosphorus, show a marked increase in brittleness at low temperatures, or "cold shortness." Experiments on the tensile strength of wrought-iron and steel show in general little variation within the usual atmospheric range of heat and cold. The tensile strength appears to be slightly reduced at very low temperatures, and to reach a maximum when the metal is warmed to a temperature between 100° C. and 200° C. When the temperature exceeds 300° C. the tensile strength begins to fall off rapidly, and at 1,000° C. it is less than one-tenth of the normal value. Reference may be made, in this connection, to the effect which a "blue heat," or temperature short of red heat, is believed to have on the plasticity and strength of iron, and more especially of mild steel. It appears that steel plates and bars bent or otherwise worked at a blue heat not only run a much more serious risk of fracture in the process than when worked either cold or red-hot, but become deteriorated so that brittleness may afterward show itself when the metal is cold.

STRICKLAND, Agnes, a popular historical writer, was born in 1806, the third daughter of Thomas Strickland, of Roydon Hall, Suffolk. Her first literary efforts were historical romances in verse in the style of

Walter Scott—*Worcester Field* (published without date), *Demetrius and other Poems* (1833). From this she passed to prose histories, written in a simple style for the young. A picturesque sketch of the *Pilgrims of Walsingham* appeared in 1835, two volumes of *Tales and Stories from History* in the following year. Then with the assistance of her sister she projected a more ambitious work, *The Lives of the Queens of England*, from Mathilda of Flanders to Queen Anne. The first volume appeared in 1840, the twelfth and last in 1849. While engaged on this work she found time to edit (in 1843) the *Letters of Mary, Queen of Scots*, whose innocence she championed with enthusiasm. In 1850 she followed up her *Queens of England* with the *Lives of the Queens of Scotland*, completing the series in eight volumes in 1859. Unresting in her industry, she turned next to the *Batchelor Kings of England*, about whom she published a volume in 1861. The *Lives of the Seven Bishops* followed in 1866—after a longer interval, part of which was employed in producing an abridged version of her *Queens of England*. Her last work was the *Lives of the Last Four Stuart Princesses*, published in 1872. She died July 8, 1874.

STRIEGAU, an industrial town of Prussia, in the province of Silesia, is situated on a small tributary of the Weistritz, thirty miles to the southwest of Breslau. It contains 11,470 inhabitants, 6,928 of whom are Protestants, and 4,379 Roman Catholics. Their chief occupations are tanning and the manufacture of albums, portfolios, and other articles in leather.

STRIKES may be properly described as organizations of workingmen or workingwomen to enforce an alleged right or remedy an alleged wrong. The term, however, applies more generally if not solely to combinations of workmen organized to secure higher wages, shorter hours of labor or certain privileges or immunities the refusal of which they declare to be an infringement of their personal rights. The term "Lockout," not infrequently confounded with strikes, means the suspension of labor in workshops, factories, mines, etc., at the instance of employers to compel the acceptance by workmen of terms or wages tendered by the former. Strikes were among the earliest means enlisted by workingmen to remedy their grievances, one having occurred in England during the fourteenth century. They were imported into the American colonies at a date prior to the Revolutionary War, and notwithstanding the protests launched against them on the score of economy alone, strikes have continued to occur at steadily decreasing intervals since 1741, when the bakers of New York "went out on a strike," but it was suppressed and the participants were placed on trial, charged with conspiracy. Fifty years later, the question of an increase of wages was raised among the journeymen boot and shoe makers of Philadelphia, who precipitated a strike which succeeded, though a similar movement by the same organization against a proposed reduction of wages in 1799 did not attain the fullest measure of success. Among the early strikes of record in the United States are the sailor strikes at New York in 1803, the Philadelphia shoemakers two years later, ship-builders of Massachusetts in 1817, and the printers' strike of 1820 at Albany, N. Y. It was during this period that the terms "scab" and "rat" were coined as expressions of contumelious comment applicable to men who declined to join in movements of the kind, either contemplated or commenced. The ensuing ten years were characterized by a frequency of strikes. Scarcely any trade was exempted from participation in movements of this kind during that period. They became more numerous also, and were more firmly contested by the opposing parties, often lasting for months, as was the case in the tailors' strike at Philadelphia during 1847, when they held out four months before they would agree to an adjustment. In 1832 the merchants and shippers of Boston refused to employ men connected with labor unions, and in 1835 the merchants of Schuylkill, Penn., established a lockout. These are believed to be the first actions taken in the United States against labor unions or favorable to lockouts as a means for the defeat of strikes. Another incident of the strikes which occurred about the same time was the establishment of the ten-hour system among the hands employed in the factories of Allegheny City, Penn., in consideration of which they submitted to a reduction of 16 per cent. in wages. This was in 1848. In the years following, strikes prevailed in various parts of the country, with results in some instances financially disastrous, and in a number of instances attended with violence. An exception to this rule was the strike in a Massachusetts mill caused by the revocation of an order theretofore prevailing allowing the employés fifteen minutes for lunch. In 1859 there was a strike inaugurated by the Pennsylvania coal miners, and in 1860, by the journeymen shoemakers of Lynn, Mass. The years included in the decade commencing with 1860 were even more productive of labor troubles than the years preceding. They occurred largely among eastern manufacturing establishments and in the mining districts of Pennsylvania, though they were incident to the railway service and other transportation corporations in various portions of the country. Proposed reductions of wages without a corresponding reduction of the hours of labor were the leading causes alleged. Arbitration was occasionally employed for a solution of the problems, but not always successfully, though in 1871 the miners' strike at Scranton, Penn., was adjusted by this means.

The strike of 1877 was perhaps the most universally engaged in and most disastrous during its continuance of any that has occurred in the United States. It began in June, at Martinsburg, W. Va., among the employés of the Baltimore and Ohio railroad system, and speedily extended in every direction. The original cause is declared to have been the reduction of wages for laborers from $1 to 90 cents per day, though it was alleged at the time that the trouble was precipitated by the incendiary speeches of labor agitators. At all events the strikes of that year are remembered as having been attended with considerable loss of life and great destruction of property. For many days during the month of July the city of Pittsburgh was in the possession of an ungovernable mob. The military, called out to suppress riotous demonstrations, were repulsed; incendiarism and riot prevailed; and railway property valued at millions of dollars, with private property worth nearly as much, was destroyed. The disorder was also pronounced and apparently beyond the power of the authorities to control at Scranton, Reading, and at other points in Pennsylvania, at Cincinnati, Indianapolis, St. Louis, Chicago, and in other of the leading cities of the country, where the danger of loss of life and the destruction of property was only restrained or put down by the military, regular troops being brought from the frontier forts for that purpose. Comparative quiet succeeded and was continued until 1880, when the Hocking Valley strikes were "declared," and spread over the entire mining territory of Ohio. They attracted universal attention and discussion. The strikes and lockouts in that year aggregated 762, mostly in New York, Pennsylvania, and Ohio.

Between 1880 and 1887 there was a total of 22,304 establishments affected by strikes, the larger proportion of which were ordered by labor unions. Of the total number 10,000 were successful, 3,000 partial failures, and 9,304 were total failures, the loss to employers amounting to $30,000,000, and $52,000,000 in round numbers to workmen. For the same period there were 2,214 lockouts, 1,753 of which were ordered by organizations: of the total number 564 were successful, 190 partially successful, and 1,339 total failures. The loss to employers was stated at $3,462,261, and $8,157,717 to employés.

Since that period strikes have neither been infrequent nor altogether successful. They include the Philadelphia brewers' strike against a reduction of wages, which lasted four months. Its success was not pronounced. At the same time the strike of coal men employed in eastern New Jersey occurred, continuing upward of a month, but without results advantageous to the workingmen, the same fate attending those who participated in the coal handlers' strike at New York and Brooklyn the same year. According to Bradstreet, 34,000 men were engaged in this latter movement. Reliable authorities place the number of strikes in 1887 at 844, of which 247 were successful, 115 partial failures, and the balance total failures. There were 128,234 employés concerned in them: 542 were for increase of wages or shorter hours of work, 225 grew out of demands by trade unions that were unsatisfied, 68 were sympathetic, and the remainder were due to causes of an unimportant character. The loss in wages was estimated at figures approximating $14,000,000.

In February, 1888, the engineers of the Chicago, Burlington and Quincy road struck for an increase of wages to a figure equal to that paid by other roads. The trouble continued until January, 1889, when it was adjusted. The latter year fewer strikes as compared with the two preceding years were of record; the most important being those prevailing in the mining districts of Illinois and Indiana, the Homestead Mills strike near Pittsburgh, St. Louis carpenters' strike, New York street-car drivers' strike, with others of less importance making up the list. The principal movement thus far, (June 1st) in 1890, has been that undertaken under the auspices of the Federation of Labor for a reduction of hours, and an increase in the rate of wages paid all classes of labor. The journeymen carpenters took the initiative, demanding eight hours labor, and wages per hour materially in advance of those paid theretofore. In many instances the demands have been acceded to, but sufficient progress has not yet been made to determine ultimate results.

STROMBOLI. See LIPARI ISLANDS.

STRONTIUM, a metallic chemical element intermediate in its character between barium and calcium, with which it forms a natural "triad." Though widely diffused as a frequent companion of calcium (including oceanic), it occurs nowhere in abundance. Its most important mineral forms are the sulphate, $SrSO_4$, known as *Cœlestine* (from the sky-blue color of certain varieties), and the carbonate, $SrCO_3$, called *Strontianite* because it was discovered first at Strontian in Argyllshire, Scotland. Crawford and (independently of him) Cruickshanks in 1790 were the first to recognize the latter mineral as a thing of its own kind and different from witherite ($BaCO_3$). Hope, in 1793, proved it to be the carbonate of a new earth, which discovery was confirmed by Klaproth.

STROPHANTHUS, a genus of plants of the natural order *Apocyneæ*, deriving its name from the long twisted thread-like segments of the corolla, which in one species attain a length of twelve or fourteen inches. The genus at present comprises about eighteen species, confined to tropical Africa and Asia, only one species, indigenous to the former continent being known outside the tropics. Several of the African species furnish the natives of the countries in which they grow with the principal ingredient in their arrow poisons.

STROUD, a market-town of Gloucestershire, England, ten miles south of Gloucester and thirty northeast of Bristol. It is picturesquely situated on an eminence environed by higher hills, but is built in a somewhat straggling and irregular fashion. The town is the principal seat of the west of England cloth manufacture, and possesses very extensive mills. There are also silk mills, scarlet-dye works, breweries, logwood-crushing mills, and flour-mills. The population of the urban sanitary district (area 999 acres) in 1881 was 7,848.

STRUENSEE, JOHANN FRIEDRICH, COUNT, Danish statesman, was of German extraction, and was born August 5, 1737, at Halle, where his father, Adam Struensee, of some eminence as a hymn writer, was pastor. He graduated M.D. at Halle in 1756, and obtained the office of physician to the town of Altona. On account, however, of a change in his religious views he quarreled with his father, and for some time he led an unsettled life, until in 1768 he was appointed personal physician to the young king, Christian VII. of Denmark, whom he accompanied on a tour through England, France, Holland, and Germany. The influence he exercised over the almost imbecile king awakened at first the jealousy of the queen, Caroline Matilda, a daughter of George II., but, having had occasion to attend her for a severe malady, he won her complete confidence also, and became equally the favorite of both. When therefore in 1770 he was appointed master of requests, he virtually took the government of the kingdom into his own hands, and on September 20th the council of state was superseded. Though acting as an absolutist, his sympathies were democratic, and he used his position to promote the general benefit of the people and to curb the influence of the nobility. The extent of his reforms, and the suddenness with which they were introduced, had all the practical effect of a revolution. They included the enfranchisement of the peasants, complete religious toleration, the abolition of commercial restrictions, the reorganization of the army, and the introduction of examinations for public offices. His reforms were received with consternation, and a conspiracy was entered into to effect his overthrow. The queen dowager persuaded Christian VII. that Struensee was carrying on an intrigue with the queen, and had entered into a plot to assassinate him, in order that he might rule as regent. He and his friend Count Brandt were consequently arrested on February 20, 1772. The attempt to prove that he had been unfaithful in his duty as minister to the king failed, but he did not deny the *liaison* with the queen, and he and Count Brandt were both beheaded and quartered on April 28th (see DENMARK).

STRUVE, FRIEDRICH GEORG WILHELM, astronomer, was born at Altona on April 15, 1793. In 1808 he entered the university of Dorpat, where he first studied philology, but soon turned his attention to astronomy. In 1813 he was appointed observer in the new university observatory, and a few years later professor of astronomy. He remained in Dorpat, occupied with researches on double stars and in geodetic work, till 1839, when he removed to Pulkova, near St. Petersburg, as director of the new Central Observatory. Here he continued his activity until he was obliged to retire (in 1861), owing to failing health. He died at St. Petersburg on November 23, 1864.

STRY, or STRYJ, a town of Galicia, Austria, is pleasantly situated on a tributary of the Dniester, about forty miles to the south of Lemberg. In 1880 it contained 12,625 inhabitants, chiefly engaged in tanning and the manufacture of matches. In 1886, however, the town was almost wholly destroyed by fire.

STRYCHNINE. See Poisons and Nux Vomica.

STRYPE, John, historian and biographer, was the son of John Strype, or Van Stryp, a native of Brabant, who to escape religious persecution went to England, and settled near London. The son was born November 1, 1643. He was educated at St. Paul's School, and on July 5, 1662, entered Jesus College, Cambridge. Thence he proceeded to Catherine Hall, where he graduated B.A. in 1665 and M.A. in 1669. He was never instituted or inducted, but in 1674 he was licensed by the bishop of London to preach and expound. He died December 11, 1737, at the advanced age of 94.

STUART, Stewart, or Steuart, the surname of a family who became heirs to the Scottish and ultimately to the English crown. Their descent is traced to a Norman baron Alan, whose eldest son William became progenitor of the earls of Arundel, and whose two younger sons Walter and Simon came to Scotland, Walter being appointed high steward of David I., who conferred on him various lands in Renfrewshire, including Paisley, where he founded the abbey in 1160. Walter, his grandson, third steward, was appointed by Alexander II. justiciary of Scotland, and, dying in 1246, left four sons and three daughters. The third son Walter obtained by marriage the earldom of Menteith, which ultimately came by marriage to Robert, duke of Albany, third son of Robert II. Alexander, fourth steward, the eldest son of Walter, third steward, inherited by his marriage with Jean, granddaughter of Somerled, the islands of Bute and Arran, and on October 2, 1263, defeated Haco at Largs. He had two sons, James and John. The latter, who commanded the men of Bute at the battle of Falkirk in 1298, had seven sons. James Stewart, the eldest son of Alexander, fourth steward, succeeded his father in 1283, and, after distinguishing himself in the wars of Wallace and of Bruce, died in 1309. His son Walter, sixth steward, who had joint command with Douglas of the left wing at the battle of Bannockburn, married Marjory, daughter of Robert the Bruce, and during the latter's absence in Ireland was intrusted with the government of the kingdom. He died in 1326, leaving an only son, who as Robert II. ascended the throne of Scotland in 1370.

The direct male line of the royal family terminated with the death of James V. in 1542, whose daughter Mary was the first to adopt the spelling "Stuart." Mary was succeeded in her lifetime in 1567 by her only son James VI., who through his father Lord Darnley was also head of the second branch, there being no surviving male issue of the family from progenitors later than Robert II. In James V., son of James IV. by Margaret, daughter of Henry VII., the claims of the English junior branch became merged in the Scottish line, and on the death of Queen Elizabeth of England, last surviving offshoot of Henry VIII., James VI. of Scotland, lineally the nearest heir, was proclaimed king of England, in accordance with a declaration of Elizabeth that no minor person should ascend the throne, but her cousin the king of Scots. The accession of James was, however, contrary to the will of Henry VIII., which favored the Suffolk branch, whose succession would probably have marvelously altered the complexion of both Scottish and English history.

The Stuarts were excluded from the throne from the defeat of Charles I. at Naseby in 1645, until the restoration of his son Charles II. in 1661. On the death of Charles II. without legitimate issue in 1685, his brother James, duke of York, ascended the throne as James II., but he so alienated the sympathies of the nation by his unconstitutional efforts to further the Catholic religion that an invitation was sent to the prince of Orange to come "to the rescue of the laws and religion of England." Next to the son of James II., still an infant under his father's control, Mary, princess of Orange, eldest daughter of James II., had the strongest claim to the crown; but neither were the claims of the prince, even apart from his marriage, very remote, since he was the son of Mary, eldest daughter of Charles I. The marriage had strengthened the claims of both, and they were proclaimed joint sovereigns of England on February 12, 1689, Scotland following the example of England on April 11th. They had no issue, and the Act of Settlement passed in 1701, excluding Catholics from the throne, secured the succession to Anne, second daughter of James II., and on her death without issue to the Protestant House of Hanover, descended from the princess Elizabeth, daughter of James I., wife of Frederick, count palatine of the Rhine. On the death of Anne in 1714, George, elector of Hanover, eldest son of Sophia, electress of Hanover (only surviving child of the princess Elizabeth), and Ernest, youngest son of George, duke of Brunswick, consequently became sovereign of Great Britain and Ireland, and, notwithstanding somewhat formidable attempts in behalf of the elder Stuart line in 1715 and 1745, the Hanoverian succession has remained uninterrupted. The female line of James II. ended with the death of his daughter, Queen Anne. James, called James III. by the Jacobites and the Old Pretender by the Hanoverians, had two sons—Charles Edward, the Young Pretender, who died without legitimate issue in 1780, and Henry, titular duke of York, commonly called Cardinal York, at whose death in 1807 the male line of James II. came to an end. He was also the last lineal male representative of any of the crowned heads of the race, so far as either England or Scotland was concerned, and excepting of course the Hanoverian line. In the female Stuart line there are, however, still nearer heirs to the throne than those of the Hanoverian line, viz., the descendants of Henrietta, duchess of Orleans, daughter of Charles I., represented now only in Maria Theresa, married to Prince Louis Leopold of Bavaria, and their nine children. The male representation of the family, being extinct in the royal lines, is claimed by the earls of Galloway and also by the Stewarts of Castlemilk, but the claims of both are more than doubtful.

STUART, Gilbert, a distinguished American portrait-painter, was born in Narragansett, R. I., December 3, 1755. He began to draw early, but none of his sketches have been preserved. His first known pictures are of two Spanish dogs, and two portraits, the latter painted when he was thirteen years old, and now in the Redwood Library, Newport. In 1770-71 he received some instruction from a Scottish artist named Cosmo Alexander, who took him to Scotland with him; but, this patron dying soon after his arrival, Stuart, after struggling for a while at the university of Glasgow, had to work his way home in a collier. In the spring of 1775 he sailed again for England, and became the pupil and assistant of Benjamin West, with whom he painted until 1785, when he set up a studio of his own. Two fine half-lengths by Stuart are in the National Gallery—his preceptor Benjamin West and the engraver Woolett. Stuart married in London and remained there, with the exception of a short visit to Dublin in 1788, until 1792, when he returned to America. Early in 1795 Stuart painted his first head of Washington. This portrait exhibits the right side of the face, and, although the least familiar, is undoubtedly the truest of the three portraits of Washington from his hand. The second was a full-length for the marquis of Lansdowne, and the third a vignette head now belonging to the Athenæum in Boston. These last two show the left side of the face, and, although they are the readily recognized "Stuart's Washington," are unsatisfactory as portraits and inferior as works of art. There are sixty-one replicas of these three pictures, and they have been engraved more than two hundred times. Stuart remained in Philadelphia, where he painted many of the prominent men of the country, until 1803, when he removed to Washington; two years later he went to Boston, where he died July 27, 1828.

STUART, John M'Douall, a South-Australian explorer, was born in England in 1818 and arrived in the colony about 1839. He accompanied Captain Sturt's 1844-45 expedition as draughtsman, and between 1858 and 1862 he made six expeditions into the interior, the last of which brought him on July 24th to the shores of the Indian Ocean at Port Darwin, the first to have crossed the island continent from south to north. It was this transcontinental expedition which led to the territorial rights, and, in defiance of geographical position, the name of South Australia being extended over so much of central and north Australia. Stuart was rewarded with $15,000 and a grant of 1,000 square miles of grazing country in the interior rent free for seven years. His name is perpetuated by Central Mount Stuart. He died in England, June 5, 1866.

STUHLWEISSENBURG (Hung. *Székes-Fehérvár;* Lat. *Alba Regia*), the capital of the county of Fehér, and in former times also of Hungary, is situated in 47° 11′ N. latitude and 18° 25′ E. longitude, in a fertile plain. It is the see of one of the oldest bishoprics in the country, and has a number of religious charities, convents, and nunneries, a seminary, a gymnasium, and a real school. It was the coronation and burial place of the Hungarian kings from the tenth to the sixteenth century, but has sunk into comparative insignificance. The town is now chiefly agricultural; its fairs, especially for horses, are famous. The population numbers 27,000.

STURGEON. Sturgeons (*Acipenser*) are a small group of fishes, of which some twenty different species are known, from European, Asiatic, and North American rivers. The distinguishing characteristics of this group, as well as its position in the system, have been sufficiently indicated in the article Ichthyology. They pass a great part of the year in the sea, but periodically ascend large rivers, some in spring to deposit their spawn, others later in the season for some purpose unknown; only a few of the species are exclusively confined to fresh water. None occur in the tropics or in the southern hemisphere.

Sturgeons are found in the greatest abundance in the rivers of southern Russia, more than ten thousand fish being sometimes caught at a single fishing-station in the fortnight during which the up-stream migration lasts. They occur in less abundance in the fresh waters of North America, where their capture is not confined to the rivers, the majority being caught in shallow portions of the shores of the great lakes. In Russia the fisheries are of immense value; yet but little is known of the sturgeon's habits, life, and early stages of development or growth. Sturgeons ranging from eight to eleven feet in length are by no means scarce, and some species grow to a much larger size. Sturgeons are ground feeders. With their projecting wedge-shaped snout they stir up the soft bottom, and by means of their sensitive barbels detect shells, crustaceans, and small fishes, on which they feed. Destitute of teeth they are unable to seize larger prey.

Where sturgeons are regularly caught in large quantities, as on the rivers of southern Russia, and on the great lakes of North America, their flesh is dried, smoked, or salted. The ovaries, which are of large size, are prepared for caviare; for this purpose they are beaten with switches, and then pressed through sieves, leaving the membranous and fibrous tissues in the sieve, while the eggs are collected in a tub. The quantity of salt added to them before they are finally packed varies with the season, scarcely any being used at the beginning of winter. Finally, one of the best sorts of isinglass is manufactured from the air-bladder. After it has been carefully removed from the body, it is washed in hot water, and cut open in its whole length, to separate the inner membrane, which has a soft consistency, and contains 70 per cent. of glutin.

STURM, Jacques Charles François, the discoverer of the algebraic theorem which bears his name, was born in Geneva in 1803. Originally tutor to the son of Madame de Stael, he subsequently resolved, in conjunction with his school-fellow Colladon, to try his fortune in the French metropolis. Sturm soon made the acquaintance of the foremost mathematicians in the capital, and obtained employment on the *Bulletin Universel*. On the discovery of his important theorem regarding the determination of the number of real roots of a numerical equation which are included between given limits, on May 23, 1829, he rapidly rose to fortune and public honors. He was chosen a member of the French Academy in 1836, became "repetiteur" in 1838, and in 1840 professor in the Polytechnic School, and finally succeeded Poisson in the chair of mechanics in the Faculty of Science at Paris. He presented numerous memoirs to the Academy, of which his admirers have said, that an impartial posterity will place them by the side of the finest memoirs of Lagrange. Sturm died at Paris on December 18, 1855.

STURT, Charles, Australian explorer, was born in England, and at an early age entered the army, in which he reached the rank of captain. Having landed in Australia with his regiment, he became interested in the geographical problems which at that time were exciting general attention. A first expedition (1828) led to the discovery of the Darling river; and a second, from which the explorer returned almost blind, made known the existence of Lake Alexandrina. For some time Captain Sturt was surveyor-general of South Australia, and he afterward filled the post of colonial secretary. The first session of the South Australian legislature (1851) voted him a pension of $3,000. From his third journey (1844-5), in which terrible hardships had to be endured, he returned quite blind, and he never altogether recovered his sight. He died at Cheltenham, England, June 16, 1869.

STUTTGART, the capital of Würtemberg, lies in the small valley of the Nesenbach, just above its confluence with the Neckar, near the center of the kingdom and about 115 miles west-by-north of Munich. It is charmingly situated among vine-clad and wooded hills, and stands at a height of nearly 900 feet above the sea. A large proportion of the most prominent buildings are clustered round the spacious Schloss-Platz, on or near which are the following edifices:—the new palace, an imposing structure of the eighteenth century, finished in 1806; the old palace, a building of the sixteenth century, with a picturesque arcaded court; the Königsbau, a huge modern building, with a fine colonnade, containing ball and concert rooms, shops, etc.; the so-called Akademie, formerly (1775-94) the seat of the Carls-Schule, where Schiller received part of his education, and now occupied by the king's private library and by guard-rooms; the new courts of justice; the palaces of the crown prince and of Prince William; the Stiftskirche, or collegiate church, a fine specimen of fifteenth century Gothic.

The art collections of Stuttgart are numerous and valuable. The museum of art comprises a picture gallery, an almost unique collection of casts of Thorwaldsen's works, and a cabinet of engravings. The royal library contains about 350,000 printed volumes, including what is said to be the largest collection of Bibles in the world, and also 4,000 MSS., many of great rarity. To these may be added the industrial museum, the cabinet of coins, the museum of natural history, the fine collection of majolica in the new palace, and the museum of antiquities. Stuttgart is the center of the publishing trade of South Germany, and has a busy industry in everything connected with the production of books. In various other industrial departments it also takes a high place, its manufactures including machinery, textile fabrics, pianos and other musical instruments, artists' colors, chemicals, sugar, and chocolate. Its trade is considerable. The population of Stuttgart in 1885 was 125,510, showing an increase of 7 per cent. since 1880. Four-fifths of these are Protestants.

STYRIA (Germ., *Steiermark* or *Steyermark*), a duchy and crownland in the Cis-Leithan part of the Austrian empire, is bounded on the north by Upper and Lower Austria, on the east by Hungary, on the south by Croatia and Carniola, and on the west by Carinthia and Salzburg. Its area is 8,630 square miles. Almost the entire district is mountainous, being occupied by various chains and ramifications of the eastern Alps. The mountains decrease in height from west to east, and the southeast part of Styria may be described as hilly rather than mountainous. There is nowhere level ground enough to form a plain in the proper acceptation of the term, but some of the valleys contain a good deal of fertile land. The rivers of Styria all drain into the Danube; the Save, the Traun, and the Enns are the most important. There are numerous small mountain lakes. The climate, of course, varies with the configuration of the surface, and there is a mean annual difference of about 7° Fahr. between the temperature of the northwest and the southeast. In spite of the irregular nature of the surface, but little of the soil can be called unproductive. About 21.40 per cent. is under tillage, 12.75 in meadow, and 16.75 in pasture, while nearly a half of the total area is covered with fine forests. The chief crops are oats, maize, rye, wheat, buckwheat, potatoes, and flax.

The great wealth of Styria, however, lies underground. Its extensive and important iron mines yield nearly one-third of the iron ore raised in the Austrian empire, and its other mineral resources include brown coal, pit-coal, copper, zinc, lead, graphite, a little gold and silver, nickel, alum, cobalt, salt, dyer's earth, potter's clay, marble, and good mill and building stones. The best known of its numerous mineral springs are the thermal springs of Tüffer, the alkaline springs of Rohitsch, and the brine springs of Aussee.

The chief industry of Styria is determined by its mineral richness, and iron-foundries, machine-shops, and manufactures of various kinds of iron and steel goods are very numerous. A special branch is the making of scythes and sickles, which are sent out of the country in large quantities. Among its other industrial products are glass, paper, cement, oil and perfumery, shoes, cotton goods, chemicals, and gunpowder. Linen-weaving is prosecuted as a household industry.

The population of Styria in 1880 was 1,213,597, equivalent to 140 per square mile, a proportion which while not high in itself, is considerably above the rate in the other mountainous regions of the empire. Nearly the whole of these profess the Roman Catholic faith, the Protestants numbering only 8,000 and the Jews about 1,000. Two-thirds of the inhabitants are Germans; the remainder, chiefly found in the south parts of the duchy, in the valleys of the Drave and Save are Slavs (Slovenes). About 65 per cent. are supported by agricultural pursuits, including forestry.

STYX, a river which the Greeks fabled to flow in the world of the dead. Homer speaks of it as a river of Hades by which the gods swore their most solemn oaths, and he couples it with the Cocytus and the Pyriphlegethon, the river of wailing and the river of burning fire. Hesiod says that Styx was a daughter of Ocean, and that, when Zeus summoned the gods to Olympus to help him fight the Titans, Styx was the first to come and her children with her; hence as a reward Zeus ordained that the most solemn oath of the gods should be by her and that her children (Emulation, Victory, Power and Force) should always live with him. In historical times the Styx was identified with a lofty waterfall near Nonacris in Arcadia. Pausanias describes the cliff over which the water falls as the highest he had ever seen, and indeed the fall is the highest in Greece. The scenery is wild and desolate. The water descends in two slender cascades, which, after winding among the rocks, unite and fall into the river Akrata (the ancient Crathis).

SUAKIN, or SUWAKIM, more correctly SAWÁKIN, the chief port of the Soudan on the Red Sea and the starting-place of caravans for Kassala and Berber, occupies a small island, placed in a deep bay in 19° 5′ N. latitude. The custom-house and Egyptian Government offices present a good frontage to the sea, and the principal houses are stately white structures, three stories high, not unlike those of Jiddah. The population of the island is mixed, with a large infusion of Arab blood. The export trade of Suakin before the revolt of the Soudan yielded a customs revenue of $300,000 a year, the chief articles besides the ivory, which was a government monopoly, being gum, cotton, sesame, senna, and hides. The place was settled by the Turks under Selim the Great, but Turkish (or Egyptian) control over the mainland was not effective till the Egyptian conquest of the Soudan. Till the suppression of the slave trade, Suakin was an important slave port; of late years slaves have been secretly run across the Red Sea from less frequented points on the coast. But legitimate commerce was rapidly growing before the revolt of the Soudan, and the port was visited by English, Egyptian, and Italian steamers.

SUARDI, BARTOLOMMEO, usually known as BRAMANTINO from his master Bramante, was a distinguished painter and architect of the Milanese school. He was specially famed for his knowledge of perspective, and Lomazzo praises him highly for the deceptive realism of his painting. The dates of his birth and death are unknown, but he was probably quite young when, about 1495, he visited Rome in company with his master Bramante; there he is said to have been employed as a painter by the pope, and he evidently spent much time in studying the remains of classical buildings in Rome. A number of measured drawings by his hand are still preserved in the Brera library at Milan. In 1525 he was appointed architect and painter to Francesco II. of Milan, and he was employed as military engineer to reconstruct the walls of the city, which was then threatened by the army of Charles V. The church of S. Satiro in Milan is usually attributed to Bramantino, but it appears to have been mainly designed by Bramante. Bramantino died between 1530 and 1536. He left an able pupil called Agostino di Milano, who worked chiefly as an architect.

SUAREZ, FRANCISCO, Spanish theologian and philosopher, was born at Granada, on January 5, 1548. After completing his studies at the university of Salamanca, he entered the Society of Jesus in 1564. The accounts of his early years represent him as backward in his development, and it was not without difficulty that he obtained admission to the order. After taking his doctorate at Evora, he was named by Philip II. principal professor of theology in the university of Coimbra. Suarez may be considered almost the last eminent representative of scholasticism. He died on September 25, 1617, at Lisbon.

SUBIACO, a town of Italy, in the province of Rome, twenty-five miles east of Tivoli and forty-two from the capital, is picturesquely situated on the right bank of the Teverone. It has iron-works and paper mills, and the population of the town is 6,503 (commune, 7,017), having decreased from 7,452 in 1868.

SUBLEYRAS, PIERRE, French painter, who passed nearly his whole life at Rome, was born at Uzès (Gard) in 1699. He left France for Italy in 1728, having carried off the great prize. He there painted for the canons of Asti *Christ's Visit to the House of Simon the Pharisee* (Louvre, engraved by Subleyras himself), a large work, which made his reputation and procured his admission into the Academy of St. Luke. Cardinal Valenti Gonzaga next obtained for him the order for Saint Basil and the Emperor Valens (small study in Louvre), which was executed in mosaic for St. Peter's. Benedict XIV. and all the princes of Rome sat to him, and the pope himself commanded two great paintings—the *Marriage of St. Catherine* and the *Ecstasy of St. Camilla*—which he placed in his private apartments. Exhausted by overwork, Subleyras tried a change to Naples, but returned to Rome at the end of a few months to die (May 28, 1749).

SUBLIME. Objects indicating great Power, vast Expanse or lofty Elevation, excite in the beholder a feeling of pleasurable elation, and the name "sublime" is applied both to the objects and to the feeling. The precise quality in things that arouses this mode of pleasurable excitement, has been variously assigned. According to Burke *terror* is one of the chief sources of SUBLIMITY; Blair suggests that *mighty power or force* is the cause; Payne Knight, *mental energy;* Kames, *height or elevation;* while Sir William Hamilton declares that SUBLIMITY requires magnitude as its condition and exists in three forms—Space, Time, and Power. The feeling has also been variously described.

SUBMARINE TELEGRAPHY. The union of the Old and New Worlds by means of the electric telegraph, probably the boldest feat of electric engineering ever projected, was first suggested by Professor Morse in 1843. Various reasons prevented his ideas taking practical shape, the principal obstacle being the unknown depth of the Atlantic and the supposed rocky nature of the bottom. When, however, Lieutenant Maury of the United States navy discovered that between Ireland and Newfoundland the bed of the ocean was nearly level and covered with soft ooze, and Mr. Cyrus W. Field and others had thoroughly discussed the practical methods, a company was formed for the purpose in 1856, to which the governments of Great Britain and the United States gave liberal guarantees.

This company, after a fruitless attempt to lay an electric cable in 1857, finally succeeded in 1858.

The cable, 2,500 miles long, and weighing one ton per mile, was composed of seven fine copper wires, cased in gutta-percha, contained in a casing of hemp saturated with pitch, beeswax and oil, the outer sheath being composed of eighteen strands of seven iron wires each. It was taken, in equal portions on board H. M. S. *Agamemnon* (91 guns) and the United States frigate *Niagara*, spliced in mid-ocean, and finally landed; the one end by the *Agamemnon* at Valentia, Ireland; the other by the *Niagara* at Trinity Bay, Newfoundland.

The result was not encouraging. The current obtained through the wire was so weak that a congratulatory message from Queen Victoria to President Buchanan, consisting of ninety words, took sixty-seven minutes to transmit. After a few more messages the cable became useless.

In consequence of this failure, it was not until 1865 that capital was found to make another attempt. This time the cable was made still heavier, and the whole length, 2,300 miles, weighing 4,000 tons, was shipped on board one vessel, the *Great Eastern.* The paying-out was commenced at Valentia, but when the vessel was 1064 miles from that port, the cable broke from an accidental strain. After a fruitless effort to fish up the broken cable from the bottom, it was abandoned for the season. In 1866 another line, so modified in construction as to be both lighter and stronger than the previous one, was successfully laid by the *Great Eastern.* The 1865 cable was then, by means of the same vessel grappled for, and brought up from a depth of two miles, spliced, and completed to Trinity Bay.

The practicability of laying an electric wire across the Atlantic being demonstrated, many lines have been projected, and several of them carried out. In 1869 a French company laid a line from Brest to St. Pierre to the south of Newfoundland. In 1873 a line was begun from Lisbon to Pernambuco in South America. This line, by means of a duplicate line from London to Lisbon, brings England into direct communication with the whole of South America. Other two cables were laid from Valentia to Trinity Bay in 1874 and 1875. The latter made by the Messrs. Siemens, weighed only 880 pounds per mile, being the lightest cable ever planned for Atlantic telegraphy. One from Penzance to St. Pierre was laid in 1879; another from England to Panama was completed in 1882; and in 1884 Messrs. Bennett and Mackay's line was laid from Valentia to Torbay in Nova Scotia.

This multiplicity of Atlantic telegraph lines has had the usual effect of competition, in reducing the rates for the transmission of messages. When the first line was opened for messages, the rates were £20 for twenty words of five letters each, and 20s for every five letters extra. The following year those rates were halved, and by successive reductions reached in August, 1869, the rate of £1, 10s, for ten words and 3s per word extra without restriction of number of letters. This rate has prevailed since, subject to occasional fluctuations consequent on disputes among the competing lines. One of these disputes caused in 1887 a reduction of the rates to 6d per word on all companies except one, which charged 1s. Still, even at the cheapest rates, long messages are very expensive. To obviate this as much as possible, several code and cipher schemes have been devised for transmitting lengthy messages by a comparatively small number of words. These schemes, subject to certain regulations, have been accepted by the post-offices and telegraph companies. The whole Atlantic system is worked in connection with the ordinary telegraph system of the world, and, with the lines to India, and Australia, may be said to bring the uttermost parts of the earth within speaking distance.

SUBORNATION OF PERJURY is the offense of procuring another to take such a false oath as constitutes PERJURY (*q. v.*) in that other. It is a misdemeanor punishable anciently by death; afterward banishment, or cutting out of the tongue; then forfeiture of goods; and latterly, as at present, by fine and imprisonment.

SUBPŒNA. The writ or process by which the attendance of a witness in a court of justice is compelled. Subpœnas issue from all courts of record and from committing magistrates, and at the demand of either the prosecution or the defense in a criminal case, or of either side in a civil action. The person on whom process is served is commanded to be and appear in court at a certain time, there to remain until discharged by the court. A subpœna can only be served within the jurisdiction of the court from which it is issued, and there is no power to compel a witness to come from another State to testify. If the witness is required to produce a document the writ is called a *subpœna duces tecum*. If the witness does not attend and has not a good legal excuse, such as dangerous illness, he may be sued or committed to prison.

SUB ROSA, under the rose, that is between ourselves or in secrecy. It was customary among the ancient Germans on occasions of festivity to suspend a rose from the ceiling above the table, as a symbol that whatever was said during the feast by those present would be afterward forgotten, or, at least, be kept as a secret among themselves.

SUBSIDIES, a term in politics, is applied in the English political history to taxes levied not immediately on property but on persons, in respect to their reputed estates, in lands or goods, or customs imposed on any of the staple commodities in addition to the *costumea magna et antiqua*. The same word is used to denote money paid by one state to another in order to procure a limited succor of auxiliary troops, ships of war or provisions.

SUBSTITUTE, MILITARY. In nations where conscription is resorted to for the supply of soldiers for the army, the lot often falls on those unwilling to serve in person. In such a case, the state sometimes agrees to accept the services of a substitute who is of equally good physique. Unless the levy be very extensive or the term of military service very long, substitutes are readily found among military men who have already served their prescribed period. Of course, the substitute must be paid for the risk he runs, and his price depends, like all other salable articles, on the demand and supply.

SUCCESSION DUTY is a sum paid to the state in England by a person benefited by the succession to certain kinds of property. In the United States succession duty is regulated by statutes. The duty varies from 1 to 6 per cent., according to the degree of consanguinity.

SUCHET, LOUIS GABRIEL, DUC D'ALBUFERA, marshal of France, one of the most brilliant of Napoleon's generals, was born March 2, 1770. As *chef de bataillon* he was present at the siege of Toulon in 1793. During the Italian campaign of 1796 he distinguished himself in most of the important contests and was severely wounded at Cerea on October 11. In October, 1797, he was appointed to the command of a demi-brigade, and in the following year his services in Switzerland were recognized by his promotion to the rank of general of brigade. In July, 1799, he was made general of division to Joubert in Italy, and, after being continued in the same office by his successors, was in 1800 named by Masséna his second in command. He took a prominent part in all the events of the Italian campaign till the peace of Lunéville, February 9, 1801. In the campaigns of 1805 and 1806 he greatly increased his reputation, more especially at Austerlitz, Saalfeld, Jena, Pultusk, and Ostrolenka. He obtained the title of count on March 19, 1808, and after taking part in the siege of Saragossa, was named generalissimo of the army of Aragon and governor of the province, which, by wise administration no less than by his brilliant valor, he in two years brought into complete submission. He annihilated the army of Blake at Maria on June 14, 1809, and on April 22, 1810, inflicted a severe defeat on O'Donnell. After being made marshal of France, July 8, 1811, he in 1812 achieved the conquest of Valencia, for which he was rewarded with the title of Duc d'Albufera. By Louis XVIII. he was on June 4 made a peer of France, but, having assisted Napoleon during the "hundred days," he was deprived of his peerage on July 24, 1815. He died near Marseilles on January 3, 1826.

SU-CHOW. There are in China three cities of this name which deserve mention. (1) Su-chow, formerly one of the largest cities in the world, and still in 1880 credited with a population of 500,000, in the province of Kiang-su, on the great Imperial canal, fifty-five miles west-northwest of Shanghai. The site is practically a cluster of islands to the east of Lake Tai-hu, and streams and canals give communication with most parts of the province. The walls are about ten miles in circumference and there are four large suburbs. Su-chow is a great commercial and manufacturing center. The great nine-storied pagoda of the northern temple is one of the finest in the country. In 1860 Su-chow was captured by the Taipings, and when in 1865 it was recovered by the valor and enterprise of General Gordon, the city, which had formerly been famous for its large and handsome buildings, was almost reduced to a heap of ruins. (2) Su-chow, formerly Tsiu-tsuan-tsiun, a free city in the province of Kan-suh, in 39° 48′ 3″ N. latitude (according to Sosnofskii), just within the extreme northwest angle of the Great Wall, near the gate of jade. It is the great center of the rhubarb trade, and used to be the residence, alternately with Lian-chaw-fu, of the governor of the province. Completely destroyed in the Dungan insurrection (1865–72), it was recovered by the Chinese in 1874 and has been rebuilt. (3) Su-chow, a commercial town situated in the province of Sze-chuen at the junction of the Min river with the Yang-tse-kiang, in 28° 46′ 50″ N. latitude.

SUCKER. See LUMP-SUCKER.

SUCKLING, SIR JOHN, one of the most admired poets and men of fashion at the court of Charles I. of England, and an active spirit in politics as well as in fashionable gayeties, belonged to a Norfolk family. His earliest biographers fixed his birth in 1613, and founded on this a reputation for extraordinary precocity in school learning. Suckling took a prominent part for a time on the Royalist side. When war was levied on the Scottish Covenanters in 1639 Suckling raised a troop of a hundred horse at his own expense and accompanied them on the bloodless expedition to the border. He was elected member for Bramber to the Long Parliament which met in November, 1640; but in May of the following year he was charged with high treason, and fled beyond sea. The circumstances of his short life in exile are obscure. The tradition is that he committed suicide in Paris some time before the end of 1642. Suckling's reputation as a poet rests not upon his plays but upon his minor pieces. The happiest as a whole is the *Ballad upon a Wedding*. "Prithee, why so pale, fond lover?" is an occasional song in *Aglaura*.

SUCRE, the capital of Bolivia, formerly known as Chuquisaca, but renamed in honor of General Sucre, the first president of the republic. Lying in 19° 2′ 45″ S. latitude, and 65° 17′ W. longitude, at a height of

9,183 feet above the sea, in a valley which drains southward to the Pilcomayo (see PLATE RIVER), it enjoys an agreeable climate and has its markets well supplied with fruits and vegetables. The city is the seat of the archbishopric of La Plata and Charcas, founded in 1609, and contains a magnificent cathedral and several imposing churches and convents. For a long time the university and colleges of Chuquisaca were among the most frequented in South America, and they are still of some note. The inhabitants, who are mainly of Indian origin, are variously stated to number 24,000 (Ondarza) and 12,000 (*Almanac de Gotha*).

SÚDÁN. See SOUDAN.

SUDBURY, an ancient borough and market town of England, chiefly in Suffolk, but partly in Essex, is situated on the river Stour, nineteen miles south of Bury St. Edmunds and fifty-eight northeast of London. It is well built and well paved and contains a number of good houses. It is chiefly interesting from its three parish churches of All Saints, St. Peter's and St. Gregory's. Cocoa-nut matting is an important manufacture, and there are also flour-mills, malt-kilns, lime-works, and brick and tile yards. A declining trade is carried on by the river, which is navigable up to the town. The population was 6,584 in 1881.

SUDRAS. See BRAHMANISM and CASTE.

SUE, JOSEPH MARIE, generally known as EUGÈNE SUE, French novelist, ranked by some as the chief practitioner of the melodramatic style in fiction, was born at Paris on December 10, 1804. Unlike most voluminous writers of light literature, Sue was a man of fortune. He was the son of a surgeon in Napoleon's army, and is said to have had the empress Josephine for godmother. But in later life he became something very different from a Bonapartist, and his residence in Savoy for the last years of his life was due to his having been banished from France after the *coup d'état.* Until his father's death in 1828 Sue pursued the same profession and was present as a surgeon both in the campaign undertaken by France in 1823 for the reëstablishment of royal power in Spain and at the battle of Navarino (1828). His naval experiences supplied much of the materials of his first novels, *Kernock le Pirate*, *Altar-Gull*, *La Salamandre*, *La Coucaratcha*, and others, which were composed at the height of the romantic movement of 1830, and displayed its Byronic enthusiasm, its fancy for outlandish subjects and names, and (in a very full measure) its extravagance. Then he took to more serious work, writing a naval history of France of no merit. His next venture was the historical or quasi-historical novel, in which style he composed *Jean Cavalier* (1840), besides other stories of adventure. About this time he was strongly affected by the socialist ideas of the day, and his attempt to display these in fiction produced (with others) his most famous and perhaps best works—*Les Mystères de Paris* (1842) and *Le Juif Errant* (1844–45). These were among the most popular specimens of the *roman-feuilleton*, then at the height of its popularity. He followed these up with divers singular and not very edifying books, such as *Les Sept Péchés Capitaux*, *Les Mystères du Peuple*, and several others, all on a very large scale, though the number of volumes—ten, twelve, and sometimes even sixteen—gives rather an exaggerated idea of their length. Some of his books, especially the *Wandering Jew* and the *Mysteries of Paris*, were dramatized by himself, usually in collaboration with others. His popularity was immense, and, despite gross faults both of art and of morality (the latter somewhat exaggerated in general estimation, at least when the work of his successors is compared), he deserved that popularity in part. After the revolution of 1848 he sat for Paris (the Seine) in the assembly from April, 1850, until his exile as above-mentioned. This exile rather stimulated than checked his literary production. The works of his last days, however (the chief of which is perhaps *Le Diable Médecin*), are on the whole much inferior to those of his middle period. Sue died at Annecy (Savoy), on August 3, 1859.

SUETONIUS. Caius Suetonius Tranquillus was one of the many second-rate authors and men of letters who lived in the early period of the Roman empire. He was the contemporary of Tacitus and the younger Pliny, and his literary work seems to have been chiefly done in the reigns of Trajan and Hadrian. To us he is known as the biographer of the twelve Cæsars, from Caius Julius down to Domitian. These lives are valuable as covering a good deal of ground where we are without the guidance of Tacitus. As Suetonius was the emperor Hadrian's private secretary, he must have had access to many important documents. It would seem from occasional references which he makes to himself in the course of the work that he was a youngish man in the reign of Domitian, and so would have had opportunities of conversing with men who had lived in the days of Tiberius, Caligula, Claudius, Nero, and had been present at the scenes of civil war and anarchy which followed the reign of the last-named.

SUEUR, EUSTACHE LE, one of the founders of the French academy of painting, was born November 19, 1617, at Paris, where he passed his whole life, and where he died on April 30, 1655. His early death and retired habits have combined to give an air of romance to his simple history, which has been decorated with as many fables as that of Claude. We are told that, persecuted by Lebrun, who was jealous of his ability, he became the intimate friend and correspondent of Poussin, and it is added that, broken-hearted at the death of his wife, Le Sueur retired to the monastery of the Chartreux and died in the arms of the prior. All this, however, is pure fiction. The facts of Le Sueur's life are these. He was the son of Cathelin Le Sueur, a turner and sculptor in wood, who placed his son with Vouet, in whose studio he rapidly distinguished himself. Admitted at an early age into the guild of master-painters, he left them to take part in establishing the academy of painting and sculpture, and was one of the first twelve professors of that body. Le Sueur's work lent itself readily to the engraver's art, for he was a charming draughtsman; he had a truly delicate perception of varied shades of grave and elevated sentiment, and possessed the power to render them.

SUEZ (SUWEIS), the port of Egypt on the Red Sea and southern terminus of the Suez Canal (see below), situated at the head of the Gulf of Suez in 29° 58′ 37″ N. latitude and 32° 31′ 18″ E. longitude. The new harbors and quays are about two miles south of the town, with which they are connected by an embankment and railway, crossing a shallow which is dry at low water; the terminal lock of the freshwater canal is on the north of the town near the English hospital and the storehouses of the Peninsular and Oriental Company. The site is naturally an absolute desert, and till the water of the Nile was introduced by the freshwater canal in 1863 the water-supply of Suez was brought across the head of the gulf from the "wells of Moses" on the Arabian coast, or else carried on camels, an hour's journey, from the fortified brackish well of Bir Suweis. Thus, in spite of its favorable position for commerce, Suez before the canal was but a small place. While the canal was in progress the population rose from 5,000 to 15,000, but has since declined. The canal, in fact, carries traffic past Suez rather than to it;

and with its mean bazaar and mosques and mongrel population the town makes an unfavorable impression on the visitor.

A canal from the Nile to the Red Sea, the indispensable condition for the existence of a prosperous trading station at Suez, appears to have existed in very early times. Classical writers say that it was first planned by Sesostris (Rameses II.), and again undertaken by Darius I., but first completed by the Ptolemies. The town at its terminus was Arsinoe or Cleopatris. The work was renewed by Trajan under the name *Augustus amnis*, but the trade from the East with Egypt still went mainly overland from Myus Hormus or from Berenice on the Red Sea, below the Gulf of Suez, to Coptus in Upper Egypt. On the Moslem conquest of Egypt the canal was restored, and is said to have remained open more than a century, till the time of Mansúr. With the Ottoman conquest Suez became more important as a naval and trading station. Ships were built there from the sixteenth century onward, and in the eighteenth century an annual fleet of nearly twenty vessels sailed from it to Jiddah, the port of correspondence with India. When the French occupied the town in 1798, and Bonaparte was full of his canal project, Suez was much decayed, and the conflicts which followed on its occupation in 1800 by an English fleet laid a great part of the town in ruins. The overland mail route from England to India by way of Suez was opened in 1837. The regular Peninsular and Oriental steamer service began a few years later, and in 1857 a railway was opened from Cairo through the desert. This line is now abandoned in favor of the railway which follows the canal from Suez to Ismailia, and then ascends the Wády Tumeilát to Zakázík, whence branches diverge to Cairo and Alexandria.

SUEZ CANAL. The great engineering features have been already treated of under CANAL. The opening of the canal to a great extent revolutionized the main lines of international traffic. More especially it has restored to the Mediterranean countries a share in the commerce of the world such as they have not possessed since the beginning of the modern period. In doing so it has naturally caused the decay of certain stations (such as St. Helena) on the ocean highways previously in vogue. In the case of sailing vessels, however, the winds at the Red Sea entrance of the canal are so frequently contrary that much of the advantage of the shortness of route is lost, and these vessels consequently still take the old-fashioned détours. Traffic, too, in the canal has so greatly increased that in 1886 a vessel was considered fortunate that got through in forty-eight hours. In 1882 ship-owners having expressed dissatisfaction with the condition of the service, schemes for rival canals were started,—one for a fresh-water canal from Alexandria to Cairo and thence to Suez by way of Tel-el-Kebir, another for a canal from Alexandria to Mansurah and Ismailia, and then parallel to the original canal to Suez, and a third for the construction of a second Suez canal, to be finished in 1888. These proposals all fell to the ground; but at length, in 1886, it was determined to widen the existing canal so as to accommodate the increased traffic, and the works are still in progress. Originally constructed by French capital, the Suez canal has passed more and more into the financial ownership as well as under the political protection of England. In 1875 the British government purchased 176,602 shares from the khedive of Egypt at the price of $19,500,000, or, including commission and expenses, $20,100,000, and exchequer bonds were issued to the value of $20,000,000.

SUFFOCATION. See ASPHYXIA AND RESPIRATION.

SUFFOLK, the most easterly county in England, is bounded east by the North Sea, north by Norfolk, west by Cambridge, and south by Essex, the boundaries being chiefly the seas and rivers; it has somewhat the shape of a half moon. Its greatest length north to south from Yarmouth to Landguard Point is about fifty miles, and its average length about thirty; its greatest breadth from east to west is about fifty-five miles. The total area of the county is 944,060 acres, or 1,475 square miles. The surface is for the most part flat or slightly undulating. In the extreme northwest round Mildenhall it joins the fen country. The coastline has a length of about fifty-two miles, and is comparatively regular, with only slight convexities toward the sea, the bays being generally shallow and the headlands rounded and only slightly prominent. The estuaries of the Deben, Orwell, and Stour are, however, of some length. The county has no valuable minerals. Cement is dug for Roman cement; and lime and whiting are obtained in various districts.

Suffolk is one of the most fertile counties in England. In the eighteenth century it was famed for its dairy products. The high prices of grain during the wars of the French Revolution led to the extensive breaking up of its pastures, and it is now one of the principal grain-growing counties in England. There is considerable variety of soils, and consequently in modes of farming, in different parts of the county.

According to the agricultural returns for 1886, 780,448 acres or nearly five-sixths of the total area were under cultivation, 363,641 being under grain crops, 120,256 under green crops, 94,893 clover and rotation grasses, 174,970 permanent pasture, 19 flax, 57 hops, and 26,612 fallow. Wheat and barley are the most important of the grain crops, having an area of 118,873 and 151,630 respectively. Horses in 1886 numbered 42,617, of which 32,262 were used solely for purposes of agriculture. The breed known as Suffolk punches is one of the most valued for agricultural purposes in England (see AGRICULTURE). Cattle numbered 70,695.

The county is essentially agricultural, and the most important manufactures relate to this branch of industry. They include that of agricultural implements, especially at Ipswich, Bury St. Edmunds, and Stowmarket, and that of artificial manures at Ipswich and Stowmarket, for which coprolites are dug. Malting is extensively carried on throughout the county. There is a gun-cotton manufactory at Stowmarket, and gun flints are still made at Brandon. At different towns a variety of small miscellaneous manufactures are carried on, including silk, cotton, linen, woolen, and horsehair and cocoa-nut matting. The principal ports are Yarmouth (situated chiefly in Norfolk), Lowestoft, Southwold, Aldeburg, Woodbridge, and Ipswich. Yarmouth is one of the most important fishing stations on the east coast of England; within the county Lowestoft is the chief fishing town. Herrings and mackerel are the fish most abundant on the coasts.

From 214,404 in 1801 the population had increased by 1821 to 271,541, by 1841 to 315,073, by 1861 to 337,070, and by 1881 to 356,893, of whom 174,606 were males and 182,287 females.

SUFFOLK, the capital of Nansemond county, Va., is situated on the Nansemond river and the Seaboard and Roanoke railroad at its junction with the Atlantic, Mississippi and Ohio road, within sight of the Great Dismal Swamp. It contains two banks, one weekly paper, a court-house, seven churches, and is the location of the Suffolk Military Academy and Collegiate Institute. The manufactures consist of cotton mills, wire works, butter dish and veneer works, sash and door factories, lumber, cypress shingles, mattresses, bricks, cigars, etc. The population in 1890 was quoted at 5,000.

SUFFRAGE (Lat. *Suffragium*, derivation uncertain), a right to vote, or more particularly, the right possessed by the citizen of a state where representative government exists to vote for a member of a legislative body. The idea that the universal enjoyment of political suffrage is a right by natural law, is grounded on the fiction that the obligations of municipal law arise out of social contract express or implied. In opposition to this notion, it is argued that the true purpose for which government exists is the general welfare of the nation; and it is the duty of the state to consider whether the suffrage may be more beneficially exercised by the many or the few. Infants, minors, idiots, and insane persons have everywhere been excluded from the suffrage on the ground that sound judgment is necessary for its exercise. Persons convicted of crimes have been excluded as a security to society; and also almost universally women, for reasons based on their relation to society and the opposite sex.

SUFISM. See MOHAMMEDANISM, MYSTICISM, and SUNNITES.

SUGAR. Formerly chemists called everything a "sugar" which had a sweet taste, and acetate of lead to this day is known as "sugar of lead" in commerce and familiar chemical parlance; but the term in its scientific sense soon came to be restricted to the sweet principles in vegetable and animal juices. Only one of these—cane sugar—was known as a pure substance until 1619, when Fabrizio Bartoletti isolated the sugar of milk and proved its individuality. In regard to all other "sugars" besides these two the knowledge of chemists was in the highest degree indefinite, and remained so until about the middle of the eighteenth century, when Marggraf made the important discovery that the sugar of the juices of beets, carrots, and certain other fleshy roots are identical with one another and with the sugar of the cane. Lowitz subsequently showed that the granular part of honey is something different from cane sugar; this was confirmed by Proust, who found also that Lowitz's honey sugar is identical with a crystallizable sugar present largely in the juice of the grape. Proust's investigations extended to other sweet vegetable juices also. All those investigated by him owed their sweetness to one or more of only three species—(1) cane sugar, (2) grape sugar, (3) (amorphous) fruit sugar. Proust's results obtain substantially to this day; a number of new sugars strictly similar to these three have been discovered since, but none are at all widely diffused throughout the organic kingdom.

The quantitative elementary composition of cane sugar was determined early in the nineteenth century by Gay-Lussac and Thénard, who may be said to have virtually established our present formula, $C_{12}H_{22}O_{11}$. All sugars and their solutions have the power of turning the plane of polarization of light.

All sugars are liable to fermentative changes; a special characteristic of the three principal vegetable sugars is that, when brought into contact as solutions with yeast (living cells of saccharomyces), under suitable conditions, they suffer vinous fermentation, *i.e.*, break up substantially into carbonic acid and alcohol.

It is remarkable that no sugar has ever been produced artificially even in the sense of being built up from other native organic substances of less chemical complexity. It is easy to produce dextrose from starch, or lævulose from inulin, or both from cane sugar, by inversion; but none of these processes is reversible by known methods. Yet the problem of producing cane sugar artificially may in a sense be said to have found a virtual solution at the hands of a German-American chemist, Fahlberg.

Glucoses. Of these a pretty large number are now known, but only lævulose and dextrose need be noticed here. Both are largely present in all kinds of sweet fruit juices and in honey. In most of these materials they are accompanied by a small proportion of cane sugar, which forcibly suggests that the glucose in fruit juices is really inverted cane sugar. But, in opposition to this surmise, the proportion of cane sugar in oranges increases during the process of ripening, and the sourest of all fruits—the lemon—contains four parts of cane for every ten of invert sugar; besides, the juices of grapes and sweet cherries contain no cane sugar whatever.

Dextrose is being produced industrially from starch by inversion and sold as grape sugar. Such grape sugar, however, is very impure. For the preparation of pure dextrose rich diabetic urine, honey, and cane sugar are convenient materials.

The liquid part of crystalline honey consists chiefly of lævulose; but its purification is difficult. From invert sugar it can be extracted, according to Dubrunfaut, by cautious addition of slaked lime at a low temperature. The lævulose separates out as a difficultly soluble lime compound, which is separated from the mother-liquor containing the dextrose by pressure and by judicious washing with cold water. The lævulosate of lime is decomposed by the exact equivalent of oxalic acid solution; then the oxalate of lime is filtered off, and the filtrate evaporated on a water-bath. The lævulose ultimately remains as a thick syrup, which formerly was supposed not to be susceptible of crystallization; but Jungfleisch and Lefranc have succeeded lately in obtaining crystals from it by means of alcohol. Lævulose is very largely soluble in water, and fully as sweet as cane sugar.

Saccharoses.—Of these only cane sugar, milk sugar, and maltose can be noticed here. The highest qualities of commercial cane sugar are chemically pure. Pure cane sugar crystallizes from its supersaturated syrup in colorless, transparent monoclinic prisms (exemplified in colorless candy sugar). The crystals are barely, if at all, hygroscopic; they are rather hard, and when broken up in the dark give off a peculiar kind of bluish light. Sp. gr. 1.593 at 4° C. From 50° upward the solubility increases at such a rate that a given quantum of water dissolves any quantity of sugar if the mixture is constantly kept boiling. Accordingly a sugar syrup when boiled down deposits nothing, but passes gradually into the condition of fused sugar when the boiling-point merges into the fusing-point of sugar, which lies at 160–161° C. Even a cold-saturated solution of sugar has the consistence of a syrup. Absolute alcohol hardly dissolves sugar at all; aqueous alcohol dissolves it the more largely the greater its proportion of water. Fused sugar freezes into a transparent glass, which is colorless if pure, but in practice generally exhibits a yellowish hue, and, if really anhydrous, remains glassy for an indefinite time. Barley-sugar and certain other confections are substantially fused sugar; but from their mode of manufacture they retain a trace of inclosed water, which constantly dissolves particles of the surrounding sugar glass to redeposit them in the less soluble form of crystals, so that barley sugar in the course of time loses its transparency through conversion into an aggregate of minute crystals.

Milk Sugar occurs in the milk of mammals, and it is doubtful whether it occurs anywhere else, although Bouchardat once proved its presence in a sample marked as sugar obtained from *Sapota Achras* (the sapodilla of the West Indies). It is made industrially in Switzerland as a bye-product in the making of cheese. It passes into the whey, from which it is extracted by evaporation to a small volume, decolorization with animal charcoal, and crystallization. From the commercial product the pure substance can be obtained by repeated recrystallization from water, and ultimately by precipitation from the aqueous solution by alcohol. Milk sugar solution when brought in contact with yeast does not suffer vinous fermentation; but certain *Spaltpilze* induce a fermentation involving the formation of alcohol and of lactic acid. This process is utilized by the Kirghiz in the production of their native drink "koumiss," made from mare's milk (see MILK). Milk sugar is used in medicine as a diluent for dry medicines. Homeopathists use it by preference. A solution of milk sugar in certain proportions of water and cow's milk is used occasionally as a substitute for mother's milk.

Maltose does not occur in nature; it is largely produced along with dextrine when starch paste is acted upon by dilute sulphuric acid or the ferment called "diastase," which is supposed to be the active agent in malt. Maltose plays an important part in the brewing of alcoholic malt liquors.

The original habitat of the sugar-cane is not known, but it seems to have been first cultivated in the country extending from Cochin China to Bengal (De Candolle). Sugar reached the West from India, and at a comparatively late date. Strabo has an inaccurate notice from Nearchus of the Indian honey-bearing reed, and various classical writers of the first century of our era notice the sweet sap of the Indian reed, or even the granulated salt-like product which was imported from India, or from Arabia and Opone (these being entrepôts of Indian trade), under the name of saccharum or σάκχαρι (from Sanskr., *sarkara*, "gravel," "sugar"), and used in medicine. The art of boiling sugar was known in Gangetic India, from which it was carried to China in the first half of the seventh century; but sugar-refining cannot have then been known, for the Chinese learned the use of ashes for this purpose only in the Mongol period, from Egyptian visitors. The cultivation of the cane in the West spread from Khúzistán in Persia. At Gundé-Shápúr in this region "sugar was prepared with art" about the time of the Arab conquest, and manufacture on a large scale was carried on at Shuster, Sús, and Askar-Mokram throughout the Middle Ages. It has been plausibly conjectured that the art of sugar-refining, which the farther East learned from the Arabs, was developed by the famous physicians of this region, in whose pharmacopœia sugar had an important place. Under the Arabs the growth and manufacture of the cane spread far and wide, from India to Sús in Morocco (Edrísí, ed. Dozy, p. 62), and were also introduced into Sicily and Andalusia.

In the age of discovery the Spaniards became in their turn the great disseminators of the sugar cultivation; the cane was planted by them in Madeira in 1420; it was carried to San Domingo in 1494; and it spread over the occupied portions of the West Indies and South America early in the sixteenth century. Within the first twenty years of the sixteenth century the sugar trade of San Domingo expanded with great rapidity, and it was from the dues levied on the imports brought thence to Spain that Charles V. obtained funds for his palace-building at Madrid and Toledo. In the Middle Ages Venice was the great European center of the sugar trade, and toward the end of the fifteenth century a Venetian citizen received a reward of 100,000 crowns for the invention of the art of making loaf-sugar.

In 1747 Andreas Sigismund Marggraf, director of the physical classes in the Academy of Sciences, Berlin, discovered the existence of common sugar in beetroot and in numerous other fleshy roots which grow in temperate regions. But no practical use was made of the discovery during his lifetime. The first to establish a beet-sugar factory was his pupil and successor, Franz Carl Achard, at Cunern (near Breslau) in Silesia, in 1801. The processes used were at first very imperfect, but the extraordinary increase in the price of sugar on the Continent caused by the Napoleonic policy gave an impetus to the industry, and beetroot factories were established at many centers both in Germany and in France. In Germany the enterprise came to an end almost entirely with the downfall of Napoleon I.; but in France, where at first more scientific and economical methods of working were introduced, the manufacturers were able to keep the industry alive. It was not, however, till after 1830 that it secured a firm footing; but from 1840 onward it advanced with giant strides. Now it is an industry of national importance, especially in Germany, controlling in the meantime the market against the cane-sugar trade. While cane sugar was practically without a rival, the cultivation was in general highly profitable, but it was conducted under tropical skies, largely by slave labor and entirely removed from scientific supervision. The staple produced at the plantations was raw sugar, which was sent to Europe to be refined. It was not till the pressure of the competition with beet sugar began to make itself felt that planters realized the necessity for improving their methods of working. It has now been found possible to apply many of the processes and appliances devised in connection with the production of beet sugar to the extraction of its older rival.

CANE SUGAR MANUFACTURE.—The sugar-cane (*Saccharum officinarum*) is a species of grass, the stalks or canes of which reach a height of from eight to fifteen feet, and attain a diameter of one and a half to two inches. The stalks are divided into prominent joints or internodes, the long sheathing alternate leaves springing from each joint. As the canes approach maturity they throw up a long smooth hollow joint termed the *arrow*, whence springs the flower head, consisting of beautiful feather-like loose panicles. The points are filled with a loose spongy fibrous mass, saturated with a juice which is at first watery but afterward becomes sweet and glutinous. As the joints ripen, the leaves wither and fall away and the stem becomes externally smooth, shining, and hard, containing much silica. The varieties of sugar-cane in cultivation are very numerous, and are distinguished from each other by external color, length of internodes (three and a half to ten inches), height to which they grow, richness in juice, and many other characteristics. The four principal classes cultivated in the West Indies are the Creole or country cane, the Tahiti cane, the Batavian cane, and the Chinese cane. An average sample of Tahiti cane at maturity contains—water, 71.04 per cent.; sugar, 18.00; ligneous tissue and pectin, 9.56; albumen, coloring matter, and insoluble salts, 1.20; silica, 0.20. The sugar-cane requires a rich, well-drained, but moist soil. It is propagated by slips taken from the upper part of the canes, which are planted at intervals about five feet apart or in close-set rows six feet apart. In the West Indies the planting takes place between June and October, and in the case of the Creole variety the canes are ready for cutting down by the beginning of January in the second following year. When mature the canes are cut down close to the ground, the remaining leaves and upper shoot removed, and the stalks immediately taken to the mill for crushing. The stalks left are liberally manured with crushed remains and ashes of former crops, combined with nitrogenous manures, and are covered over; they then send up a crop of new stems, termed *rattoons*. The system of rattooning can be continued for several years, but the canes so treated go on declining in size and in yield of sugar. The yield of canes, of course, varies within wide limits; but twenty tons per acre may be regarded as a good average crop.

Cane-Crushing.—The juice is extracted by pressing the canes in a sugar-mill between three, or sometimes five, heavy close-set rollers of iron, placed horizontally in a powerful framework or cheeks. In a three-roller mill they consist of a *cane, top*, and *megass* roller respectively. The top roller is set above and between the other two, and under its periphery is a fixed metal plate called the *trash turner*, which guides the cane coming from between the cane and top rollers into the bite between the top and megass rollers. Generally the cane roller is screwed up to within half an inch of the top roller, while the free space between top and megass rollers is considerably less. The mill is set in motion by steam power, and the canes are fed by hand on a travelling band or carrier into the rollers. If a thick feed is placed at one side and little at the other, one portion passes through imperfectly crushed, while the other severely strains the mill and may either stop the machinery or cause a breakdown by some portion giving way. The yield of juice obtained with an ordinary mill varies from 60 to 65 per cent. One of the most useful devices for improving the machinery is the substitution of a hydraulic attachment, which can be applied to the headstocks of any of the rollers, in place of the rigid and immovable screws and wedges of the ordinary mill. This secures a uniform pressure with the most irregular feed and much greater pressure than is possible with rigid rollers, resulting in a greatly increased yield of juice (67 to 70 per cent.) and a megass or refuse proportionately drier and therefore more available for fuel for steam-raising. The juice from the mill is led into a trough, whence it is carried by pipes to the clarifiers. But even the most perfect system of mechanical pressure leaves a large percentage of sugar in the refuse cane, and to remedy this the diffusion method, which has been attended with remarkable success in the beet industry, has been also applied to the extraction of cane juice. The juice is a turbid frothy liquid of a yellowish green color, with a specific gravity of from 1.070 to about 1.100. The variety of cane cultivated, its age, and especially the nature of the season in which it has grown as regards rain, all have an important influence on the yield of sugar. The expressed juice contains from 15 to 18 per cent. of solids, showing on a good average—sugar, 14.55 per cent.; glucose, 1.65; non-saccharine solids, .917; ash, .283. The juice got from sugar-cane is much richer in sugar and less contaminated with non-saccharine solids than that yielded by beet; and its pleasant taste and aromatic odor contrasts markedly with the acrid taste and unpleasant smell of beet juice.

In the hot climates where sugar-canes grow a process of fermentation is almost immediately set up in the impure juices from the canes, causing the formation of invert sugar and later products of fermentation, and thereby a serious loss of sugar. It is therefore essential that with the least possible delay the manufacturing processes should be proceeded with. The juice is first filtered through a set of sieves to remove the mechanical impurities it carries from the mill. Then it is run into the clarifiers, a series of iron vessels capable of holding six or eight hundred gallons of juice, and in these it is heated up to about 130° Fahr., and milk of lime is added in quantity sufficient to neutralize the acid constituents it contains. The heat is then raised to just under the boiling point, when gradually a thick scum rises and forms on the surface, and when the defecation thereby effected is completed the clear liquid below is drawn off. Various other substances besides lime are employed for the defecation of juice, one of which, the bisulphite of lime in the so-called Icery process, has attained considerable favor.

From the clarifier the juice passes on to the battery, a range of three to five pans or "coppers," heated by direct fire, in which it is concentrated down to the crystallizing point. The juice, gradually increasing in density, is passed from one into the other till it reaches the last of the series, the *striking teach*, in which it is concentrated to the granulating point. The skimmings from these pans are collected and used for making rum. From the striking teach the concentrated juice is removed to shallow coolers, in which the crystals form. A few days later it is transferred to hogsheads in the curing-house, and the molasses is drained away from the crystallized raw sugar into tanks. The sugar so obtained is the *muscovado* of the sugar-refiners, and both that and the molasses form their principal raw materials. Clayed sugar consists of raw sugar from which a portion of the adherent molasses has been dissolved by the action of moisture percolating through it from moist clay laid over its surface. Labor difficulties and scarcity of water operate against the general introduction of improved systems of working cane-juice, but in many plantations central usines or sugar-factories have been established with great success. In these the canes of many growers are worked up with the aid of the *triple effect apparatus*, the vacuum pan, and the centrifugal separator employed by beet manufacturers.

BEET SUGAR MANUFACTURE.—The sugar beet is a cultivated variety of *Beta maritima* (natural order *Chenopodiaceæ*), other varieties of which, under the name of mangold or mangel wurzel, are grown as feeding-roots for cattle. The plants are cultivated like turnips, and the roots attain their maturity in about five months after sowing, being gathered during September and October. The efforts of growers have been largely directed to the development of roots yielding juice rich in sugar, and especially in Germany these efforts have been stimulated by the circumstance that excise duty on inland sugar is there calculated on the roots. The duty is based on the assumption that from 12½ parts of beet 1 part of grain sugar is obtained; but in actual practice 1 part of raw sugar is now yielded by 9.27 parts of root. Moreover, when the sugar is exported a drawback is paid for that on which no duty was actually levied, and hence indirectly comes the so-called bounty on German sugar.

Two distinct ways of obtaining the juice from beet are now principally employed—pressure and diffusion. The mechanical methods of pressure are principally used in France; the process of diffusion is all but universal in Germany. Formerly a modified diffusion process—maceration—was in use; but it has now been generally abandoned, as has also been a means of separating the juice by centrifugal action. For the mechanical processes the roots have first to be reduced to a condition of fine pulp. For this purpose the roots, thoroughly trimmed and washed, are fed into a pulping machine, in which a large drum or cylinder, armed with close-set rows of saw-toothed blades, is revolved with great rapidity, so that the fleshy roots on coming against them are rasped down to a fine uniform pulp. The operation is assisted by pouring small quantities of water or of watery juice on the revolving drum, which thins the pulp somewhat, and aids the free flow of the juice in the subsequent operation. The expression of the juice is effected either by the hydraulic press or by continuous roller presses. From the hydraulic press the juice flows freely at first; but in order to obtain the largest possible yield it is necessary to moisten the first press-cake and submit it to a second pressure, whereby a thin watery juice is expressed. After having been pressed twice, the cake that is left should amount to not more than 17 per cent. of the original roots; hence, allowing 4 per cent. for ligneous tissue, etc., only about 13 per cent. of water, sugar, and soluble salts, etc., remain in the refuse. For the system of continuous pressure presses analogous to the mills employed for cane-crushing are used. Many modifications of the roller press have been introduced, and, although the best express from 3 to 5 per cent. less juice than the hydraulic press, they have several advantages under the system formerly common in France, which bound the maker to return press-cake containing a certain proportion of sugar for use as a feeding-stuff on the farm. In certain forms of press the lower rollers are perforated to allow the escape of the expressed juice; in some the rollers are covered with india-rubber, so that they give an elastic squeeze on an extended surface; and in others the pulp is carried in an endless cloth through a series of rollers, being all the while subjected to gradually increasing pressure.

The diffusion process for obtaining beet juice depends on the action of dialysis, in which two liquids of different degrees of concentration separated by a membrane tend to transfuse through the membrane till equilibrium of solution is attained.

Sugar-refiners deal indifferently with raw cane and beetroot sugars which come into the market, and by precisely the same series of operations. The sugar is first melted in charges of five or six tons in *blow-ups*—cast-iron tanks fitted with mechanical stirrers and steam-pipes for heating the water. The solution called *liquor* is brought to a certain degree of gravity, from twenty-five to thirty-three Baumé, and formerly it was the practice to treat it, especially when low qualities of sugar were operated on, with blood albumen. The hot liquor is next passed through twilled cotton bags encased in a meshing of hemp, through which the solution is mechanically strained. From 50 to 200 of these filters are suspended in close chambers, in which they are kept hot, from the bottom of a perforated iron tank, each perforation having under it a bag. These bags have from time to time to be taken off for cleaning out and washing. From the bag filter the liquor is passed for decolorizing through beds of animal charcoal inclosed in cisterns to a depth of from thirty to fifty feet, the sugar being received into tanks for concentration in the vacuum pan. In that apparatus it is "boiled to grain," and the treatment is varied according to the nature of the finished sugar to be made. To make loaves small crystals only are formed in the pan, and the granular magma is run into steam-jacketed open pans and raised to a temperature of about 180° to 190° Fahr., which liquefies the grains. The hot solution is then cast into conical molds, the form of the loaf, in which the sugar as it cools crystallizes into a solid mass, still surrounded and mixed with a syrup containing colored and other impurities. After thorough settling and crystallization, a plug at the bottom of the mold is opened and the syrup allowed to drain away. To whiten the loaves they are treated with successive doses of saturated syrup, ending with a syrup of pure colorless sugar. These doses are poured on the upper side of the cone, and, percolating down through the porous mass, carry with them the impure green syrup which still may adhere to the crystals. The liquor which obstinately remains in the interstices is driven out by suction or centrifugal action; the loaf is rounded off, papered, and placed in a stove for drying. The syrup which drains from the loaves is sold as golden syrup.

The stem of the Guinea corn or sorghum (*Sorghum saccharatum*) has long been known in China as a source of sugar, and the possibility of cultivating it as a rival to the sugarcane and beetroot has attracted much attention in America. The sorghum is hardier than the sugarcane; it comes to maturity in a season; and it retains its maximum sugar content a considerable time, giving opportunity for leisurely harvesting. The sugar is obtained by the same method as cane sugar. The cultivation of sorghum sugar has not found much favor in this country; the total yield of sugar from sorghum in 1885 did not exceed 600,000 pounds.

The sap of the rock or sugar maple, *Acer saccharinum*, a large tree growing in the United States and Canada, yields a local supply of sugar, which also occasionally finds its way into commerce. The sap is collected in spring, just before the foliage develops, and is procured by making a notch or boring a hole in the stem of the tree about three feet from the ground. A tree may yield three gallons of juice a day and continue flowing for six weeks; but on an average only about four pounds of sugar are obtained from each tree, four to six gallons of sap giving one pound of sugar. The sap is purified and concentrated in a simple manner, the whole work being carried on by farmers, who themselves use much of the product for domestic and culinary purposes. The total production of the United States ranges from 30,000,000 to 50,000,000 pounds, principally obtained in Vermont, New York, Ohio, and Pennsylvania. In Canada also a considerable quantity of maple sugar is collected for domestic use.

SUGAR-BIRD, the English name commonly given in the West India Islands to the various members of the genus *Certhiola* (generally regarded as belonging to the Family *Cœredidæ*) from their habit of frequenting the curing-houses where sugar is kept, apparently attracted thither by the swarms of flies. These little birds on account of their pretty plumage and their familiarity are usually favorites. They often come into dwelling-houses, where they preserve great coolness, hopping gravely from one piece of furniture to another and carefully exploring the surrounding objects with intent to find a spider or insect. In their figure and motions they remind a northern naturalist of a Nuthatch, while their coloration—black, yellow, olive, gray, and white—recalls to him a Titmouse. They generally keep in pairs and build a domed but untidy nest, laying therein three eggs, white blotched with rusty-red.

SUGDEN, EDWARD BURTENSHAW. See ST. LEONARDS, LORD.

SUHL, a manufacturing town in an isolated portion of Prussian Saxony, is picturesquely situated on the Lauter, on the southern slope of the Thuringian Forest, six and one-half miles to the northeast of Meiningen and twenty-nine miles to the southwest of Erfurt. It still contains large factories for firearms (military and sporting) and side arms, besides iron-works, machine-works, potteries, and tanneries. The once considerable manufacture of fustian has declined. A brine spring (Soolquelle) at the foot of the neighboring Domberg is said to have given name to the town. The population in 1880 was 9,937 and 10,605 in 1885.

SUICIDE. The phenomenon of suicide has at all times attracted a large amount of attention from moralists and social investigators. Though of very small dimensions, even in the countries where it is most prevalent, its existence is rightly looked upon as a sign of the presence of maladies in the body politic which, whether remediable or not, deserve careful examination. To those who look at human affairs from a theological standpoint, suicide necessarily assumes a graver aspect, being regarded, not as a minute and rather obscure disease of the social organism, but as an appalling sign of the tendency of man to resist the will of

God. Compare Felo de Se. As a great number of persons are, either directly or indirectly, under the influence of the theological bias, and as the act of suicide is in itself of a striking character to the imagination, the importance of the phenomenon from a sociological point of view has been to some extent exaggerated, especially in those countries of the Continent where suicides are most numerous. Moreover, the matter has during the last twenty years become of direct interest to the governments of those countries where the whole able-bodied male population are more or less under the control of a military organization; for, rightly or wrongly, a portion of the recent considerable increase in the suicide rate of Prussia, Saxony, Austria, and France is attributed to dislike of military service. It may be observed in passing that the suicide rate among soldiers is high in all countries. As enlistment is voluntary in the United Kingdom, the alleged dislike to conscription cannot be the sole cause of the high rate prevailing in some of the Continental states.

The influence of age on suicide shows considerable regularity in each country from year to year, and a certain degree of similarity in its effects is perceptible in all countries.

Taking both sexes together, the suicide rate rises steadily and rapidly after the tenth year has been passed, attaining its maximum in the period fifty-five to sixty-five years, after which it remains almost stationary for another ten years, when it sinks rapidly. Although no figures are given for any period previous to the tenth year, Doctor Ogle mentions that there were actually four cases of suicide of children between the ages of five and ten during the twenty-six years observed. Child suicide is apparently of more frequent occurrence on the Continent than in the British Isles. It is important to notice that the age scale of suicide for women is materially different from that for men.

May and June are in most countries the months in which most suicides occur; but in some countries, such as Bavaria and Saxony, the maximum is in July. The difference between the warm and cold portions of the year is more marked in female suicides than in male suicides, especially in Italy. This is probably due to the fact that women show a tendency to adopt drowning as a mode of killing themselves, and that there is more shrinking from a plunge into water in cold than in warm weather. The fact that the maximum number of suicides occurs in the hot season, during which, according to Morselli and other Continental statisticians, insanity is more frequent than in the cool portions of the year, has been alleged as a reason for the high suicide rate in May, June and July.

The favorite mode of suicide in England and America is among men hanging and among women drowning, about one-third of the suicides of each sex being effected in these modes respectively. In Italy, however, the most common mode is by gunshot among men, and after that by drowning, hanging being less usual. A very large number of Italian women drown themselves, the proportion being in some years over 50 per cent. of the total. In Prussia considerably over one-half the male suicides hang themselves, and the women also make use of the rope more than in England. The use of poison is more common among English women than among those of Italy and Prussia. Doctor Ogle observes that women take less care than men to select painless poisons, nearly 50 per cent. of female suicides by poison in England during the years 1863–82 being effected by means of strychnia, vermin killer, carbolic acid, and oxalic acid, while 60 per cent. of the men employed prussic acid, laudanum, and other comparatively painless poisons.

SUIDAS, the author of a Greek lexicon. His personal life is totally unknown and even his date is uncertain. He must have lived before Eustathius (twelfth century), who quotes him repeatedly. Under the heading "Adam" the author of the lexicon gives a brief chronology of the world, ending with the death of the emperor John Zimisces. Under "Constantinople" are mentioned the emperors Basil and Constantine, who succeeded John Zimisces in 975. It would thus appear that Suidas lived in the latter part of the tenth century.

SULLA. The life of Lucius Cornelius Sulla makes one of the most important chapters in Roman history. Both as a general and as a politician he stands in the foremost rank of the remarkable figures of all time. It was by his ability and his force of character that Sulla, who had neither great wealth nor noble ancestry to back him up, pushed himself to the front in early manhood, distinguishing himself in the Jugurthine War in 107 and 106, and being able with a good show of reason to claim the credit of having terminated that troublesome war by capturing Jugurtha himself. In these African campaigns Sulla showed that he knew how to win the hearts and confidence of his soldiers, and through his whole subsequent career the secret of his brilliant successes seems to have been the enthusiastic devotion of his troops, whom he continued to hold well in hand, while he let them indulge themselves in plundering and in all manner of license. From the year 104 to 101 he served under Marius in the war with the Cimbri and Teutones and fought in the last great battle near Verona, which annihilated the barbarian host. Marius, it is said, was jealous of him, and any friendly feeling there may have hitherto been between the two now finally ceased. Sulla on his return to Rome lived quietly for some years and took no part in politics. In 93 he was elected prætor after a lavish squandering of money, and he delighted the populace with an exhibition of a hundred lions from Africa, from the realm of King Bocchus. Next year (92) he went to the East with special authority from the senate to put pressure on the famous Mithradates of Pontus, and make him give back Cappadocia to its petty prince Ariobarzanes, one of Rome's dependants in Asia, whom he had driven out. Sulla with a small army soon won a victory over the general of Mithradates, and Rome's client-king was restored. An embassy from the Parthians now came to solicit the honor of alliance with Rome, and Sulla was the first Roman who held diplomatic intercourse with that remote people. In the year 91, which brought with it the imminent prospect of revolution and of sweeping political change, with the enfranchisement of the Italian peoples, Sulla returned to Rome, and it was generally felt that he was the man to head the conservative and aristocratic party. Who was to have the command in the Mithradatic War and be intrusted with the settlement of the East was the question of the day, and the choice lay plainly between Marius and Sulla. The rivalry between the two men and their partisans was as bitter as it could possibly be. Marius was old, but he had by no means lost his prestige with the popular party.

Meanwhile Mithradates and the East were forgotten in the crisis of the Social or Italic War, which broke out in 91 and threatened Rome's very existence. The services of both Marius and Sulla were needed, and were given; but Sulla was the more successful, or, at any rate, the more fortunate. In 88 Sulla was consul; the revolt of Italy was at an end; and again the question came to the front—who was to go to the East and encounter the warlike king of Pontus, against whom war had been declared. The tribune Publius Sulpicius Rufus moved that Marius should have the command;

there was fearful rioting and bloodshed at Rome at the prompting of the popular leaders, Sulla narrowly escaping to his legions in Campania, whence he marched on Rome, being the first Roman who entered the city at the head of a Roman army. Marius now had to fly; and he and his party were crushed for the time.

Sulla, leaving things quiet at Rome, quitted Italy in 87 for the East, taking Greece on his way, and for the next four years he was winning victory after victory against the armies of Mithradates and accumulating boundless plunder. Athens, the headquarters of the Mithradatic cause, was taken and sacked in 86, and Sulla possessed himself of a library which contained Aristotle's works. In the same year at Chæroneia, the scene of Philip of Macedon's memorable victory more than two and a half centuries before, and in the year following, at the neighboring Orchomenus, he scattered like chaff, with hardly any loss to himself, immense hosts of the enemy. Crossing the Hellespont in 84 into Asia, he was joined by the troops of Fimbria, who soon deserted their general, a man sent out by the Marian party, now again in the ascendant at Rome. The same year peace was concluded with Mithradates on condition that he should resign all his recent conquests, give up all claim to meddle with Rome's Asiatic dependencies, and pay a considerable indemnity. In fact the king was to be put back to the position he held before the war; but as he raised cavils and Sulla's soldiers wanted better terms and more spoil, he had in the end to content himself with being on the same footing as the other princes of Asia—simply a vassal of Rome.

Sulla returned to Italy in 83, landing at Brundusium, having previously informed the senate in an official dispatch of the result of his campaigns in Greece and Asia, and announced his presence on Italian ground. The revolutionary party, specially represented by Cinna, Carbo, and the younger Marius, had massacred his adherents wholesale, confiscated his property, and declared him a public enemy. They felt they must resist him to the death, and with numerous bodies of troops scattered throughout Italy, and the support of the newly enfranchised Italians, to whom it was understood that Sulla was bitterly hostile, they counted confidently on success, but on Sulla's advance at the head of his 40,000 veterans many of them lost heart and deserted their leaders, while for the most part the Italians themselves, whom he confirmed in the possession of their new privileges, were won over to his side. Only the Samnites, who were as yet without the Roman franchise, remained his enemies, and it seemed as if the old war between Rome and Samnium had to be fought once again. Several Roman nobles, among them Cneius Pompeius (Pompey the Great), Metellus Pius, Marcus Crassus, Marcus Lucullus, joined Sulla, and in the following year (82) he won a decisive victory over the younger Marius near Præneste (Palestrina), and then marched straight upon Rome, where again, just before his defeat of Marius, there had been a great massacre of his adherents, in which the famous and learned jurist Mucius Scævola perished. Rome was at the same time in extreme peril from the advance of a Samnite army, and was barely saved by Sulla, who, after a bloody and very hard-fought battle, routed the enemy before the walls of Rome. With the death of the younger Marius, who killed himself after the surrender of Præneste to one of Sulla's officers, the civil war was at an end, and Sulla was master of Rome and of the Roman world. Then came, with the object of breaking the neck of the Marian or popular party, the memorable "proscription," when for the first time in Roman history a list of men declared to be outlaws and public enemies was exhibited in the forum, and a reign of terror—a succession of wholesale murders and confiscations throughout Rome and Italy—made the name of Sulla forever infamous. The title of "dictator" was revived after a long period and conferred upon him; Sulla was in fact emperor of Rome, with absolute power over the life and fortunes of every Roman citizen.

In 79 Sulla resigned his dictatorship and retired to Puteoli, where he died in the following year, probably from the bursting of a blood-vessel, though there is a story that he fell a victim to a particularly loathsome disease similar to that which cut off one of the Herods.

SULLY, Maximilian de Béthune, Duke of, French statesman, was born at the château of Rosny near Mantes on December 13, 1560. He derived his early appellation and the title of baron from the place of his birth, and was known as Rosny during the greater part of his life. He was only eleven years old when his father, who was a Protestant, was presented to Henry of Navarre, and from that time he was more or less inseparably attached to the future king of France. He had a narrow escape on St. Bartholomew's Day, but he did escape, and when little more than sixteen began to take an active part in the Civil Wars. He distinguished himself not a little, especially in the character of engineer. In 1583 he married Anne de Courtenay, who, however, died in 1589, and in the intervals of war he lived the life of a country gentleman at Rosny. At the battle of Ivry, 1590, he had the good luck, though seriously wounded, to capture Mayenne's standard. As soon as Henry's power was established, Sully, who, though by no means always a complaisant or obliging servant, had been uniformly faithful, received his reward in the shape of numerous places, estates, and dignities. In 1601 he was made grand-master of the ordnance and in 1606 duke of Sully. He was also practically the king's minister of finance during the greater part of his reign. After the assassination of his master he makes no further figure in history, though he survived for many years, saw the rise of a far greater minister than himself, and did not die till (less than a year before Richelieu himself died) December 22, 1641, at Villebon near Chartres.

SULMONA, or Solmona, a city of Italy, in the province of Aquila (Abruzzo Ulteriore). Aquila lies, at a height of 1,575 feet above the sea, at the junction of the Vella with the Gizio (a tributary of the Pescara), which supplies water-power to its paper-mills, fulling-mills, copper-works, etc. Besides its cathedral (S. Panfilo), rebuilt by Bishop Walther of Ocre (Frederick II.'s grand chancellor) in 1119, and several times remodeled in the fifteenth and sixteenth centuries, Sulmona has in Santa Maria della Tomba a good example of pure Gothic, and in Corpus Domini a striking instance of the vagaries of Gothic in its decay. A statue of Ovid, the most celebrated native of the city (which also gave birth to Innocent VII.), stands in front of the cancellaria. The population of Sulmona was 14,171 in 1881 (commune 17,601).

SULPHUR. The sulphur minerals, which are very numerous and varied, arrange themselves under three heads—(1) *metallic sulphates*, of which hydrated sulphate of lime, $CaSO_4.2H_2O$, gypsum, is the most abundant; (2) *metallic sulphides*, a numerous family, including the majority of metallic ores, of which, however, only iron pyrites serves as a source for sulphur; (3) *elementary sulphur*. In the organic world we meet with sulphur everywhere, this element forming an essential (though quantitatively subordinate) component of the albuminoids, a class of compounds contained in all vegetable and animal structures. Of organic materials rich in sulphur we may name animal hair (containing about 4 per cent.) and the essential oils of the onion, garlic, and mustard.

Elementary Sulphur occurs as a mineral chiefly in the Upper Miocene deposits and in the Flötz, associated in general with gypsum, massive limestone, and marl. Commercially important deposits are found in Sicily (provinces of Caltanissetta, Girgenti, Catania) Italy (Latera and Scrofano, province of Rome), Spain (Teruel and Arcos), France (dept. Vauclause), Transylvania, Poland (Swoszowice near Cracow), and Germany (Lüneburg, in Hanover). The exhalations of volcanoes include, as a rule, sulphurous acid, SO_2, and sulphuretted hydrogen, H_2S, which two gases, if moist, readily decompose each other into water and sulphur—a circumstance which accounts for the constant occurrence of sulphur in all volcanic districts. The molten sulphur discharged from the crater of the Alaghez in the Armenian highlands forms solid excrescences, which the natives dislodge from their inaccessible positions by means of rifle-shots. A sulphur deposit near the Borax Lake in California is estimated to contain 20,000 tons. Most of the sulphur or brimstone of commerce comes from the rich fields of Sicily, where the annual production has reached 400,000 tons.

SULPHURIC ACID is the chemical name of the liquid commercially and properly known as *Oil of Vitriol.* It is a dense, colorless, oily liquid, without smell, and of an intensely acid taste and reaction. Sulphuric acid, in its free state, is a very rare natural product; although, in connection with bases, it is common in the animal and vegetable, and abundant in the inorganic kingdom. The only cases in which it is known to occur free are certain American rivers, especially the Rio Vinagre, and some lakes in Tennessee and in Java, and it is found to be a normal constituent of the saliva of *Dolium Galia*, a species of snail found in Sicily. Sulphuric acid may be prepared on a small scale by boiling in *aqua regia*, or in nitric acid, the sulphur becoming gradually oxidized into sulphuric acid. In order to obtain the acid in pure form, suitable for medical use or medico-legal analysis, it must be redistilled with sulphate of ammonia in a retort containing a few slips of platinum foil, the first and the last portions being rejected. The distillation is attended with violent concussions, partly owing to the high specific gravity of the acid, partly owing to its high boiling point, and this convulsive action is moderated mechanically by the platinum slips.

Thus prepared, according to the directions of the *British Pharmacopœia*, it may be regarded as perfectly pure, presuming arsenic is not present. The acid is employed in the arts and manufactures for a large number of purposes, as a desiccating agent for use in the laboratory, the development of oxygen gas, and in the preparation of the salt-cake used in the manufacture of carbonate of soda. As a medicine diluted sulphuric acid exerts a strong astringent power. In ordinary diarrhea and in the premonitory diarrhea of cholera, painters' colic, etc., dilute sulphuric acid is of great use, and sulphuric acid lemonade is valuable as a prophylactic against the latter disease. There are two processes by which Sulphuric acid is prepared on a large scale: by the distillation of green sulphate of iron, Valentine's process, and by the oxidation of sulphurous acid through the agency of nitric acid and hypo-nitric acid, likewise discovered by Valentine and universally followed in Great Britain. When sulphate is employed for producing sulphurous acid, it is placed in an oven under which a small fire is lighted. The fire is allowed to go out after the sulphur has ignited. Above the sulphur is a niter pot containing either nitrate of soda or nitrate of potash, into which sufficient sulphuric acid to cause decomposition is introduced. This decomposition furnishes nitric acid fumes which go over into the chamber along with the sulphurous acid, the latter extracting from the nitric acid the additional equivalent of oxygen required for its conversion into sulphuric acid, reducing the nitrous compound from nitric acid to nitrous oxide, the latter in its turn quickly converting itself into nitrous acid by the abstraction of two additional equivalents of oxygen from the air that is constantly entering the chamber through the burners. The chamber is a large box or room elevated above the ground. The progress of the gases is retarded and promotion of the desired transformations secured by curtains of lead proceeding alternately from the bottom to the top of the chamber and *vice versa.* The floor of the chamber is covered with water, into which the sulphuric acid falls as it is formed, and when the solution is strong enough is drawn off. To prevent the waste of nitrous acid when the gases reach the chimney, a tower filled with coke is provided, through which a constant stream of strong sulphuric acid trickles, absorbing the nitrous fumes on their way upward. Suitable burners are employed when iron pyrites is used as the source of sulphurous acid. An important improvement has recently been introduced into the manufacture of sulphuric acid which consists in passing the gaseous sulphurous acid through what is called a "denitrating tower," instead of conducting it from the sulphur or pyrites burners direct to the lead chamber. This has the effect, it is claimed, of purifying the sulphuric acid of nitrogen compounds which are used in the lead chamber, and in the concentration of "Chamber Acid," without the use of lead pans and coal.

The manufacture of sulphuric acid is very extensive in the United States, where it is used in the production of soda and other commodities.

SULPICIUS SEVERUS. See SEVERUS.

SULTÁNPUR, or SULTANPOOR, a district of British India, in the Rái Bareli (Roy Bareilly) division of Oudh, under the jurisdiction of the lieutenant-governor of the North-Western Provinces. With an area of 1,707 square miles, it is bounded on the north by Faizábád, on the east by Jaunpur, on the south by Partábgarh, and on the west by Rái Bareli. The surface of the district is generally level, being broken only by ravines in the neighborhood of the rivers by which its drainage is effected. The principal river is the Gumti, which passes through the center of Sultánpur and affords a valuable highway for commerce. Minor streams are the Kándu, Píli, Tengha, and Nandhia, the last two being of some importance, as their channels are deep, though narrow, and form the outlet for the superfluous water of the extensive series of jhils. There are no forests in the district, the only tree-covered tracts being stunted *dhák* jungles used for fuel. The climate is considered mild, temperate, and healthy; the average annual rainfall is about forty-six inches.

The population, according to the census of 1881, was 957,912 (males 475,125, females 482,787), of whom 856,329 were Hindus and 101,524 Mohammedans. The only town with a population exceeding 5,000 is Sultánpur, the administrative headquarters of the district, which is situated on the right bank of the Gumti, and in 1881 contained 9,374 inhabitants.

SULU ISLANDS. See PHILIPPINES.

SUMACH is a species of plants of the genus *Rhus*, shrubs or small trees of an order known as *Anacardiacea*, of which there are from ten to a dozen species in the United States. Of the latter, the Virginia Sumach is probably the best known. It grows to the height of fifteen or twenty feet, having crooked branches, large compound leaves, small flowers, greenish yellow in color, and berries covered with crimson colored hairs. The stem, when cut, exudes a yellowish resinous juice, and from the branches and berries when boiled, a black ink-like tincture. The berries possess an acid taste and besides being harmless and palatable, may be employed for purposes of dyeing carmine colors. They also contain malic acid and are sometimes used as a substitute for lemons. Many varieties of this species grow wild in all parts of North America, and the leaves changing in autumn to a purple or red form, are highly ornamental.

Closely allied to the above to which it bears a pronounced resemblance is the Smooth Sumach, *R. glabra*, growing to the height of twelve feet occasionally, but generally from two to ten feet. The flowers are also of a greenish-yellow blue, the fruit crimson in color and slightly tart to the taste. The leaves are long compound and have from eleven to thirty-one leaflets. The branches are smooth. The dwarf sumach belongs to the same species. The leaflets, from ten to twenty-one in number, are of a dark green color, smooth and shining; the tree is found on rocky eminences as also in the lowlands. The leaves of all this species contain a considerable percentage of tannin, and are gathered extensively in Virginia and elsewhere for tanning light qualities of leather and for dyeing calico.

There is still another group, *R. laxicodendron* and *R. Venenata*. The former is also known as poison Ivy, and the latter as swamp Sumach, poison Elder and poison Dogwood. This variety is found in swamps from Maine to Louisiana, also in Canada. It grows to the height of twenty feet in some instances, and yields a juice which becomes black in color. The leaves are smooth and shiny. Both species are poisonous to the touch, causing small pustules lasting for many days and itching and burning to a degree. The eruption, however, can be cured by the use of hot water and carbonate of soda.

Among the other species is the sweet scented Sumach, indigenous to America. The leaves give forth an agreeable perfume. They are also used as smoking tobacco by the Indians, to whom they are known by the name of *Kinni-Kinnick; R. Veniciferea* and *R. Semialata*, the latter resulting from deposits of eggs by insects, also *R. Coriaria* or Sicilian Sumach, which is cultivated in Sicily, and valuable for tanning, the plant containing almost 40 per cent. of tannin. These compose the remaining species.

SUMATRA, in Malay called *Pulu Partcha* or *Indalas*, is one of the largest and most important islands of the East Indian Archipelago. It stretches from northwest to southeast for a distance of 1,047 miles—Tandjong Batu, the northmost point, being situated in 5° 40′ N. latitude and the southmost in 5° 59′ S. latitude. The greatest breadth is about 230 miles. In area it is estimated that Sumatra, with its 170,744 square miles, is thirteen times the size of Holland, of which country the island is in large measure a dependency. The northern half runs obliquely parallel to the Malay Peninsula, from which it is separated by the Strait of Malacca, and the southern end is separated by the narrow Sunda Strait from Java. Unlike Java, Sumatra has a series of considerable islands (Nias Islands, Mentawei Islands, etc.) arranged like outworks in front of the coast that faces the open Indian Ocean. The general physical features of the island are simple and striking: a range of lofty mountains extends throughout its whole length, their western slopes descending rapidly toward the ocean and their eastern looking out over a vast alluvial tract of unusual uniformity. This mountain range is known as Bukit Barisan or Chain Mountain. It varies in average height from 1,500 to 6,000 feet, and consists of three or four ridges separated by plateau-like valleys. The mountainous regions contain numerous lakes, many of them evidently the craters of extinct volcanoes. When, as sometimes happens, two or three of these craters have merged into one, the lake attains a great size.

Sumatra still possesses several centers of volcanic eruption, and in 1883 its southern extremity shared with Java in the disasters of the Krakatoa outbreak. Indrapura sends up from time to time heavy columns of smoke. Merapi, the most active of the volcanoes in the island, was in full eruption in the years 1807, 1822, 1834, 1845, 1863–64, and 1872. Mt. Talang, in the Padang Highlands, also has three craters, one of which is filled with molten sulphur. Junghuhn registered sixteen Sumatran volcanoes, and others have since been discovered.

Sumatra possesses various kinds of mineral wealth. Gold occurs in the central regions; gold mines have long been worked in Menangkabau and the interior of Padang, and gold-washing is carried on in several of the streams. Tin, which forms the staple of the neighboring island of Bangka or BANCA (*q.v.*), is found more especially in Siak and the "division" of the L. Kotas. Copper mines are worked in the Padang Highlands (most largely in the district of Lake Sinkarah) and at Muki in Achin. Iron is not infrequent, and magnetic iron is obtained at the "Iron Mountain" near Fort van der Capellen (Tanah Datar). Coal seams exist in the Malabuh valley (Achin), in the Sinamu valley, and on both sides of the Ombilin (Umbilin) river; the Ombilin field was brought into notice more especially by Mr. D. D. Veth of the 1877–79 expedition. Lignite of good quality is found in several localities. Oil wells are worked at Langkat and other places; and arsenic, saltpeter, alum, naphtha, and sulphur may be collected in the volcanic districts.

The process by which the Dutch have advanced to their present position in Sumatra has been a very gradual one, and even yet, though their supremacy is effective all round the coast, much of the interior remains practically unpossessed.

Though Sumatra is separated from Java by so narrow a strait, the botanist at once finds that he has broken new ground when he crosses to the northern island, and the farther he advances inward the more striking becomes the originality of the flora. The alang fields, which play a great part in Java, have even a wider range in Sumatra, descending to within 700 or 800 feet of sea-level; wherever a space in the forest is cleared this aggressive grass begins to take possession of the soil, and if once it be fully rooted the woodland has great difficulty in reëstablishing itself. A remarkable feature of the Sumatra flora is the great variety of trees that vie with each other in stature and beauty, and as a timber-producing country the island ranks high even among the richly wooded lands of the archipelago. The process of reckless deforestation is, however, beginning to tell on certain districts—the natives often destroying a whole tree for a plank or rafter. The principal cultivated plants, apart from sugar cane and coffee, are rice (in great variety of kinds), the cocoa-nut palm, the areng palm, the areca and the sago palms, maize (jagung), yams, and sweet potatoes; and among the fruit trees are the Indian tamarind, the blimbing, pomegranate, jambosa, guava, pawpaw, orange, and lemon. Even before the arrival of Europeans Sumatra was known for its pepper plantations; and these still form the most conspicuous feature of the south of the island. For the foreign market coffee is the most important of all the crops—the Padang districts being the chief seat of its cultivation. Benzoin was formerly obtained almost exclusively from Sumatra from the *Styrax Benzoin*

The bulk of the Sumatran population is Malayan; but to what extent the Malay has absorbed pre-Malayan blood is still open to investigation. The Kubus, a race or tribe still found in an emphatically savage state in the interior, have been by some regarded as the remains of an aboriginal stock. They speak the Malay dialect of the district to which they belong.

One of the most interesting of all the savage or semi-savage peoples is the Battaks or Batahs. About these a great deal has been written since Junghuhn published his *Die Battaländer* in 1847. It is not known whether they were settled in Sumatra before the Hindu period. Their language contains words of Sanskrit origin and others most readily referred to Javanese, Malay, Menangkabau, Macassar, Sundanese, Niasese, and Tagal influence. At the present time they occupy the country to the southeast of Achin, in the center of which lies the great Toba Lake; but it is evident that they formerly possessed, or at least were present in, various other districts both north and south.

The physical conditions of large tracts render it certain that as a whole the island cannot be thickly peopled. In 1881 the government *Almanac* gave the population of the Dutch possessions as 2,142,873 (2,894 Europeans, 2,098,984 natives, 11,289 Chinese, 1,929 "Arabs," and 27,777 Orientals of other stock). To this considerable additions must be made, as the kingdom of Achin (356,000 at least), as well as Indragiri and Kwanten (about 30,000). Perhaps a fair estimate for the whole is somewhat under 3,500,000. The Nias islands would add 230,000 to the total. The most populous region is the government of the West Coast.

As far as is known, Sumatran civilization and culture are of Hindu origin; and it is not improbable that the island was the first of all the archipelago to receive the Indian immigrants who played so important a part in the history of the region.

Subjoined are a few leading events in the recent history of Sumatra. The island, or rather the portions possessed by the Dutch, were British from 1811 to 1816. 1821. Second expedition against Palembang; Palembang captured June 23d. 1822. Menangkabau recognized Dutch authority. 1825. Benkulen taken over from the English in May. 1837. Cultivation of coffee extended in West Coast region by Governor A. v. Michiels. 1840. Extension of the West Coast government to Sinkil. 1851. Revolt suppressed in Palembang; expedition to the Lampong districts. 1853. Cholera rages in the island; Raja Tiang Alam, ringleader of the revolt in Palembang, surrenders. 1858. Expedition against Jambi; sultan dethroned and treaty made with his successor. 1860. Redjang added to Palembang residency. 1863. Expedition against Nias. 1865. Expedition against Asahan and Serdang (East Coast). 1872. Agreement with the British government in regard to Sumatra. 1873. War in Achin commenced. 1874. Capture of the kraton of Achin. 1876. Capture of the VI., IV., and IX. Mukims (Achin); expedition against Kota Jutan (East Coast); emancipation of slaves on West Coast. 1878. Benkulen made a residency; civil administration of Achin and dependencies intrusted to a governor.

SUMBAL, or SUMBUL, also called MUSK ROOT, a drug recently introduced into European medical practice. It consists of the root of *Ferula Sumbul*, Hook., a tall Umbelliferous plant found in the north of Bokhara, its range apparently extending beyond the Amur. It was first brought to Russia in 1835 as a substitute for musk; it was subsequently recommended as a remedy for cholera, and in 1867 was introduced into the British pharmacopœia. Sumbal is used in medicine as an antispasmodic and stimulating tonic, especially in nervous diseases. It owes its medicinal properties to a balsamic resin and an essential oil. Of the former it contains about 9 per cent. and of the latter .33 per cent.

SUMBAWA (properly SAMBAWA or SAMAWA), an island of the East Indian Archipelago, one of the Sunda group, lies between 8° 6′ and 9° 3′ S. latitude and 116° 47′ and 119° 12′ E. longitude, to the east of Lombok, from which it is separated by the narrow Allas strait. Its area is estimated at 5,186 square miles. The population was computed to number about 150,000 in 1887. The whole surface of Sumbawa is mountainous: G. Nyenges, in the western peninsula, is 5,560 feet high, and G. Tambora, in the eastern, which is said to have lost a third of its elevation in the eruption of 1815, is still 8,697 feet high. There are no navigable streams. The climate and productions are not unlike those of Java, though the rains are heavier, the drought more severe, and the fertility less. Sulphur, arsenic, asphalt, and petroleum are the mineral products. Mohammedanism prevails throughout the island, except among certain mountain tribes.

Sumbawa is divided into four independent states—Sumbawa proper, Dompo, Sangar, and Bima. Two other states on the northern extremity of the island were so devastated by the Tambora eruption of 1815 that their territory, after lying for long uninhabited, was in 1866 divided between Dompo and Sangar. Sumbawa proper occupies the western peninsula.

SUMMARY JURISDICTION. By a court of summary jurisdiction is meant a court in which cases are heard and determined by a justice or justices of the peace, without the intervention of a jury. Such a court has duties to perform of two different kinds. It either hears and determines a case in a judicial capacity, or it acts rather in a ministerial capacity where a *prima facie* case has been established, as by issuing a warrant of distress, or by committing an accused person for the decision of a higher court. It is to the court acting in the former capacity that the term "court of summary jurisdiction" more strictly applies. Ever since the first institution of justices of the peace (see JUSTICE OF THE PEACE), the tendency of English legislation has been to enlarge their jurisdiction and to enable offenses of a less heinous nature to be tried in their courts without a jury. This inroad upon the functions of the jury can only be made by legislation. "The common law is a stranger to it, unless in the case of contempts," says Blackstone. At common law all offenses must be proceeded against by indictment, and an indictment can only be tried before a jury. Even where an offense is created by statute and is unknown to the common law the procedure must be by indictment, unless the statute creating the offense or some other statute specially makes it summary. The summary jurisdiction exercised by justices is the only one of much practical importance.

By Art. III. s. 2 of the constitution of the United States the trial of all crimes, except in cases of impeachment, is to be by jury. By Art. V. of the amendments no person can be held to answer for a capital or otherwise infamous crime unless on a presentment or indictment of a grand jury. Considerable changes have been made by State legislation in the direction of enlarging the powers of courts of summary jurisdiction.

SUMMONS (*summonitio*) is a legal form demanding the attendance of a person in parliament (see PEERAGE) or before a court of justice. The term as it applies to courts of justice is used both in civil and in criminal procedure, but is not applied universally to all cases of demanding attendance.

In the United States a summons is issued in any court of competent jurisdiction as a preface to a civil suit. It is unknown in criminal proceedings in this country.

SUMNER, CHARLES, was born at Boston, Mass., January 6, 1811. He graduated at Harvard in 1830, and studied law with Judge Story. His natural powers of mind were great, his habits of study intense, and his success immediate and conspicuous. Everything seems to have been expected of him, and he disappointed nobody. In 1834 he had been admitted to the bar, was editor of the *American Jurist*, and was reporting the decisions of Judge Story. For the next three years he was a lecturer in the Harvard law school. He then spent three years in Europe, always, however, studying with an intensity that never relaxed. Returning, he began the practice of law, but gradually drifted into politics during the anti-slavery struggle. In 1851 the few "free-soilers" in the Massachusetts legislature offered to vote for Democrats for other officers in return for Democratic votes for Sumner as United States senator. Sumner was thus sent to the Senate, to which he was regularly re-elected for the rest of his life. He at once became a man of mark, though not of popularity, in the Senate. His fine personal presence, his somewhat florid rhetoric, his wealth of citation from learned and foreign tongues, his wide foreign acquaintance, high culture, and social standing, seem to have staggered his Southern colleagues. They could not look down upon him, and they hardly knew what else to do. A long series of speeches brought about an assault upon him, May 22, 1856, by Preston S. Brooks, a representative from South Carolina, in retaliation for Sumner's criticism of Brooks' uncle, a senator from his State. Brooks found Sumner writing in the Senate chamber, and beat him so cruelly that he narrowly escaped death. He was absent from his place until 1859, and never fully recovered from the effects of the assault. When his party took control of the Senate in 1861 Sumner became one of its foremost members. Like Stevens (see STEVENS), he propounded a theory of the relations of the seceding States to the Union which never was endorsed, but had its influence on the outcome of reconstruction. In the American Union States are autonomous, but Territories are theoretically under the absolute government of Congress, though in practice Congress gives them as much self-government as is possible or prudent. A Territory becomes a State by admission through an Act of Congress. Sumner held that the national boundaries of the Union were so fixed that no State could escape from them by secession, that a State's secession was merely an abandonment of its Statehood, so that it fell back into the condition of a Territory, and came under the absolute government of Congress. This "State-suicide" theory was in due time condemned by the Supreme Court, which held that a State could not lose its Statehood; but Congress had really acted upon it already in several points of reconstruction. Sumner's peculiar field was in the Senate committee on foreign relations, of which he was chairman from 1861 until 1871. It was during this period, in 1869, that he urged the "indirect" items of the Alabama claims, sacrificing without hesitation the English popularity which had always been dear to him. Within a year or two he felt compelled to oppose the new administration of President Grant in several particulars. In the expectation of gratifying the president, the Republican senators removed Sumner from his chairmanship; and, like Seward, he passed his later years in general opposition to the party which he had helped to organize. In December, 1872, he introduced a resolution that the names of victories over fellow-citizens should be removed from the regimental flags of the army. For this his State legislature censured him, but the censure was rescinded just before his death. He had been from the beginning of the Civil War the advocate of emancipation and of the grant of full status to the negroes; and for the last few years of his life his energies were devoted to forwarding his Civil Rights Bill, intended to give the freedmen the same legal rights as the whites. He died at Washington on March 11, 1874.

SUMPTUARY LAWS are those intended to limit or regulate the private expenditure of the citizens of a community. They may be dictated by political, or economic, or moral considerations. They have existed both in ancient and in modern states. In Greece, it was among the Dorian races, whose temper was austere and rigid, that they most prevailed. All the inhabitants of Laconia were forbidden to attend drinking entertainments, nor could a Lacedæmonian possess a house or furniture which was the work of more elaborate implements than the ax and saw. The possession of gold or silver was interdicted to the citizens of Sparta, and the use of iron money alone was permitted by the Lycurgean legislation. In the Locrian code of Zaleucus citizens were forbidden to drink undiluted wine. The Solonian sumptuary enactments were directed principally against the extravagance of female apparel and dowries of excessive amount; costly banquets also were forbidden, and expensive funeral solemnities. The Pythagoreans in Magna Græcia not only protested against the luxury of their time but encouraged legislation with a view to restraining it.

At Rome the system of sumptuary edicts and enactments was largely developed, while the objects of such legislation were concurrently sought to be attained through the exercise of the censorial power. The code of the Twelve Tables contained provisions limiting the expenditure on funerals. The most important sumptuary laws of the Roman commonwealth were those which follow. (1) The Oppian law, 215 B.C., provided that no woman should possess more than half an ounce of gold, or wear a dress of different colors, or ride in a carriage in the city or within a mile of it except on occasions of public religious ceremonies. This law, which had been partly dictated by the financial necessities of the conflict with Hannibal, was repealed twenty years later, against the advice of Cato. (2) The Orchian law, 187 B.C., limited the number of guests at entertainments. (3) The Fannian law, 161 B.C., limited the sums to be spent on entertainments. (4) The Didian law, 143 B.C., extended to the whole of Italy the provisions of the Fannian law, and made the guests as well as the givers of entertainments at which the law was violated liable to the penalties. Suetonius mentions some regulations made by Nero, and we hear of further legislation of this kind by Hadrian and later emperors. In the time of Tertullian the sumptuary laws appear to have been things of the past, (*Apol.*, c. vi.)

In modern times the first important sumptuary legislation was—in Italy that of Frederick II.; in Aragon that of James I., in 1234; in France that of Philip IV.; in England that of Edward II. and Edward III. Some of the statutes were repealed, but similar ones were passed again. They seem, however, to have had little effect, for in the reign of Richard II. excesses prevailed, apparently in a still greater degree. Another statute was passed in the year 1463 (3 Edw. IV. c. 5) for the regulation of the dress of persons of all ranks. An Act of 1444 had previously regulated the clothing, when it formed a part of the wages, of servants employed in husbandry. Already in the reign of Edward II. a proclamation had been issued against the "outrageous and excessive multitude of meats and dishes which the great men of the kingdom had used, and still used, in their castles," as well as "persons of inferior rank imitating their example, beyond what their stations required and their circumstances could afford;" and the rule was laid down that the great men should have but two courses of flesh meat served up to their tables, and on fish days two courses of fish, each course consisting of but two kinds. In 1363, at the same time when costumes were regulated, it was enacted that the servants of gentlemen, merchants, and artificers should have only one meal of flesh or fish in the day, and that their other food should consist of milk, butter, and cheese. Similar Acts to those above mentioned were passed in Scotland also. A Scottish sumptuary law of 1621 was the last of the kind in Great Britain.

SUMTER, Fort, originally spelled Sumpter, after General Sumpter, in whose honor it was named, was built 1845–55, in the form of a truncated pentagon fifty feet high, on an artificial island, at the entrance of Charleston harbor, two and one-half miles distant from Forts Moultrie and Pinckney on either side. On the secession of South Carolina, December, 1860, Major Anderson, in command of the defenses of the harbor, was called upon to surrender them to the State authorities. Instead of doing this, he abandoned the other forts and occupied Fort Sumter, mounting fifty-two guns with a garrison of seventy men. This was considered an act of war by the Confederates and their troops, who, under command of General Beauregard, took possession of Forts Pinckney and Moultrie and erected additional batteries. While the surrender of the fort was under consideration, a fleet was sent from New York for its relief. On its appearance off the harbor the attack on the fort was opened, April 12, 1861, and it surrendered on the following day. This event aroused the North and began the war which terminated in 1865. During the siege of Charleston this fort was battered by the heaviest artillery until its walls were completely crushed and shattered. The flag shaft was shot away fifty times, and thousands of tons of iron projectiles were mingled with the débris of the fort, but the garrison constructed a still stronger fortress on its ruins, and held it for three years against assault and bombardments until the operations of General Sherman compelled its evacuation, and the United States flag was again raised, April 14, 1865; an event shortly subsequent to the evacuation of Richmond and the surrender of Lee at Appomattox.

SUMY, a district town of Little Russia, in the government of Kharkoff, situated 125 miles to the northwest of the chief town of the government, was founded in 1652 by Little Russian Cossacks. It is poorly built, chiefly of wood, but is an important center for the trade of Great Russia with Little Russia—cattle and corn being sent to the north in exchange for various kinds of manufactured and grocery wares. It has a classical pro-gymnasium and a technical school. Its inhabitants, who numbered 16,030 in 1884, are engaged in commerce, in various kinds of petty trades, and in agriculture.

SUN. (See Astronomy.) The sun as ordinarily visible to us, bounded by the photosphere, is only a small part of the real sun: from observations made during eclipses it is now known that outside the photosphere are—first, an envelope, namely the chromosphere, which is mainly composed of hydrogen, and outside this another envelope, called the corona, while there is evidence that outside these, and especially along the plane of the sun's equator, there is a considerable extension of matter which may or may not be of the same nature as that of which the corona is composed.

These various parts of the solar economy have been examined by the spectroscope, and from this examination two widely divergent views have arisen.

According to the first view, the true atmosphere of the sun is limited by the chromosphere, and the constituents of that atmosphere consist essentially of the vapors of the chemical elements recognized on the earth. It will be seen that on this view the corona and the equatorial extension observed occasionally are merely solar appendages. In the other view the atmosphere of the sun is extended to the confines of the corona, the temperature naturally increasing as we descend; and it is held that toward the photosphere the temperature is so high that the chemical elements are dissociated into finer forms of matter, so that descending vapors get more simple, ascending vapors get more complex, and it is only in the cooler regions of the atmosphere that vapors resembling those of our terrestrial elements can exist, while near the confines of the corona these vapors give place to solid particles and masses. It will be obvious that the true mean density of the sun cannot be the same on the two hypotheses to which we have referred. If the atmosphere is practically limited by the photosphere, it has been found that the density of the sun is 1.444, water being taken as unity. If we include the corona in the sun's atmosphere, and assume that its height is half a million of miles above the photosphere, then the volume of the sun is ten times that bounded by the photosphere, and the density is reduced to a tenth of the value given above.

When we come to bring the chemical evidence together which has been acquired by the examination of separate parts of the solar economy, we find, as has been already hinted, that the apparent similarity in chemical structure suggested by tables entirely breaks down. Not only is the chemical nature of each separate solar phenomenon different from that of any other, but the facts of observation are in all cases entirely new and strange, so that very little light is obtained toward the understanding of them from ordinary laboratory work.

The spectrum of the spots differs from that of the ordinary surface of the sun chiefly by the widening of certain of the Fraunhofer lines in the spot spectrum—some being excessively widened. The lines which are most widened change from spot to spot and from year to year. The most extensive sunspot observations of this nature have been carried on in Kensington, and the conclusions derived from 700 observations on spots between 1879 and 1885 are that the spot spectra are very unlike the ordinary spectrum of the sun. An immense variation was observed between the most widened lines seen in the first hundred observations; that there was as much inversion between them as between any two metals; that very few lines are strongly affected at the same time in the same spot; that while many lines seen in spots are visible at low temperature, none are brightened or intensified when we pass from the temperature of the electric arc to that of the electric spark; certain lines of substance indicated rest while other adjacent lines showed change of wave-length, and that a large number of lines seen in spots were common to two or more substances with the dispersion employed. Toward the end of the first series of investigations there appeared among the most widened lines a few lines which are not represented among the lines seen in the spectra of terrestrial elements. This change took place when there was a marked increase in the solar activity. It was further ascertained that the most widened lines change with the sunspot period, that at and after the minimum the lines are chiefly known lines of the various metals and that at and after the maximum the lines are chiefly of unknown origin, these changes indicating an increased temperature in the spots at the sun-spot maximum.

The general result is that in passing from minimum to maximum the lines most affected change from those of the ordinary chemical elements to lines whose significance are not known.

The chromosphere when quite quiescent merely gives us a spectrum of hydrogen together with a line in the yellow, which, from its proximity to D_1 and D_2, is called D_3. The chromosphere is disturbed in two ways—first, by prominences, and second, by the formation gradually and peacefully of domes, which are of no great height but sometimes extend over large areas and last for weeks. These last-named phenomena have been termed "wellings up," the idea being that they were produced by the gradual uprise of vapors from below; but it is clear that the same phenomena might be produced by the very slow descent of matter from above. In 1871 the sun was more active, and this activity resulted in the addition of new lines, all, however, absolutely unknown to us, except one, which represents a line in the spectrum of titanium; but in that case we get one line out of 201 in exactly the same way as we get two only of iron out of 460. The prominences are of two kinds—those which are relatively quiet and give almost exclusively the lines of hydrogen and those in which the motions are as a rule very violent. The spectrum of the latter class generally includes a large number of metallic lines; hence they are generally called metallic prominences.

The spectrum of the inner corona indicates that it is chiefly composed of hydrogen. In the outer corona most of the hydrogen lines disappear; but one, the green line, remains, indicating, as far as we can see where everything is so doubtful, that the constituents of the outer corona consist most probably of hydrogen in a cool form. We also know that the outer corona contains particles which reflect the ordinary sunlight to us, because in 1871 Doctor Janssen, and in 1878 Professor Barker and others, saw the dark Fraunhofer lines in the spectrum of the corona. We must imagine, therefore, that some part of that spectrum depends for its existence on solid particles which not only give a spectrum like that of the lime-light but have the faculty of reflecting to us the light of the underlying photosphere. It was also put beyond all question in the eclipse of 1882 in Egypt that this corona has another spectrum of its own.

Observations of prominences, spots, and other phenomena which require continuous investigation have been carefully made from day to day for several years, and one conclusion arrived at is that when and where the (disturbed) spots are at the maximum the faculæ and metallic prominences are also at the maximum. When the maximum changes from north to south latitude in the spots it also changes from north to south in the metallic prominences and the faculæ. These observations, therefore, establish not only an important connection between spots, metallic prominences, and faculæ, but also the fact of the wonderful localization of these phenomena upon the sun. The spots are never seen higher in latitude than 40° north or south, and they are invariably seen in smaller quantity at the equator. Similarly, the faculæ and metallic prominences do not go much beyond 40° north or south, and their minima are also at the equator.

Although the more important of these solar phenomena are limited to certain zones of the sun's surface, and although they vary very violently, they have a cycle or regular succession of changes, during which the particular zone of the sun on which they appear alters. When there is the smallest number of spots on the sun—that is to say, when there is a sun-spot minimum—the spots that appear are seen in a high latitude, and the latitude decreases gradually until we arrive at the next minimum. At the maximum period of sun spots the latitude of the spot zone is about 15°. Activity in the solar atmosphere, therefore, appears to begin in a high latitude—say about 30° or 35°—and very soon reaches the maximum in about latitude 15°, then it gradually dies away until spots, metallic prominences, and faculæ—all of reduced intensity—cling pretty near to the solar equator, and at the same time we get a new wave of activity, beginning again in a high latitude. Pores, which are in reality nothing but small sun spots, may occur in any part of the sun, and are always accompanied by a slight waviness in the chromosphere.

The main periodicity of the sun is that, of about eleven years, which elapses between two successive maxima or minima. When the sun is quietest, there are very few of the ordinary tree-like prominences visible, and there is an especial dearth of them near the poles and the equator. At the minimum period the chief feature is a very great extension of the corona in the direction of the solar equator, and a wonderfully exquisite outcurving right and left at both poles.

The time between the minimum and the maximum sun-spot periods is three or four years, and that from maximum to minimum seven or eight years, so that the sun increases in activity much more rapidly than it afterward decreases in passing to the next minimum. During the maximum period all the solar forces are doing their utmost, and we see in prominences and spots, and indeed in every outcome of action that we can refer to, indications of the most gigantic energies being at work. At this time also we note the greatest velocities of down-rush in the vapors which form the spots and of the up-rush in those which form the prominences. These changes are accompanied by corresponding changes in the corona; and, fortunately, we have photographic records for two periods of maximum—1871 and 1882. In these the streamers, instead of being limited to the equator or to mid-latitudes, exist in all latitudes, so that they practically extend to every part of the sun. In the eclipse of 1882 the corona indicated a more equal distribution of action than that of 1871, but the general result was the same.

After the maximum period there is a gradual falling off of all the various energies, the mean latitudes of the spots decreasing until they reach 8° N. and 8° S.; then another series of spots breaks out about 35° N. and 35° S. latitude, and the cycle begins anew.

It has been very generally accepted for some time that sun-spots are depressions in the photosphere, produced by downfalls of cool material.

Besides the general darkening near the edge of the sun's disk, the surface is seen to be strangely mottled near the poles, near the equator, and in fact universally. Moreover, small black specks, called *granulations* or *pores*, are everywhere visible, and spectroscopic examination shows that every one of these is a true spot. The fine mottlings frequently indicate the existence of powerful currents in that they take definite directions, sometimes in straight lines, sometimes in lines suggesting cyclonic swirls. In addition to the pores spots of a smudgy kind, called *veiled spots*, are sometimes seen, and it is probable that in such cases the force of the down-rush is insufficient to depress the photosphere to an extent competent to give rise to the ordinary dark spots. Some spots appear as large pores, that is, they consist of nothing but umbra; others appear as well-developed veiled spots, consisting almost entirely of penumbra. The obvious large spots consisting of umbra and penumbra follow next in order of intensity, and, as has been previously pointed out, their appearance is confined to definite spot zones. Minute observation, therefore, shows that the whole of the sun's surface is traversed by down-rushes of varying intensities, from almost infinitesimal dimensions to the most powerful that we can conceive. Gravitation is of course the main factor operating in the production of a down-rush. The velocity produced by gravitation in matter falling from great heights above the photosphere must be very great, and in consequence the kinetic energy of the moving mass must also be great. The motion is impeded by friction with the gases in the sun's atmosphere, and some or perhaps all the kinetic energy becomes heat. The heat thus developed must produce sudden expansions, and the initial down-rush is surrounded by up-rushes along the lines of least resistance. The effects of such down-rushes vary in degree according to the quantity of matter falling and the height from which it falls.

Equally, too, there are observed different degrees of the effects of up-rushes. The next condition of increased action exhibits itself in the growing complexity of the chemical nature and of the form of the chromosphere. Occasionally the whole level of the chromosphere over a large region seems to be quietly raised, and observation proves this to be due to the intrusion of other vapors. There is either a gradual evaporation from the photosphere or a gradual vaporization or expansion of slowly falling material over large regions, raising the level of the sea of hydrogen. The chromosphere then appears to contain different layers, and the lower we descend toward the photosphere the less we know about the substances that exist there. The next degree of disturbance is seen in what are called the *quiet prominences*, which very frequently occur in regions where the beginning of a disturbance has been previously indicated by the appearance of domes and metallic strata. As a rule the quiet prominences are not very high. They are almost entirely composed of hydrogen, or at least of a substance which gives some of the lines observed in the spectrum of hydrogen. The upward velocity of the gases forming these prominences is seldom very great. When a prominence disappears it does not follow that the substances of which it was composed have also disappeared, and there is evidence to show that the apparent disappearance is due to a reduction of temperature. The most intense degree of action of an up-rush is exhibited by the metallic prominences, which contain other substances in addition to hydrogen. Such prominences have been seen with an upward velocity of 250 miles a second, and of a height as great as 400,000 miles. There is also evidence that some prominences consist of mixed up-rushes and down-rushes, and it may turn out eventually that this is the case in all the metallic prominences.

The height of the solar atmosphere is greater over the equator than at the poles; particles condensed on the outside at the poles have therefore a relatively small velocity when they fall into the photosphere, and are able to produce only pores or veiled spots. Over the equator the particles attain a higher velocity in their fall, but they also have to pass through a much greater thickness of atmosphere and undergo so much dissociation that on reaching the photosphere they are incompetent to produce spots. In mid-latitudes, therefore, the falls of condensed particles should be most effective in producing spots. In this way the absence of spots at the poles and equator is explained—one of the best-known facts of solar physics. From minimum to minimum there is a regular decrease in the latitude of spots; hence it is clear that there must be currents from the poles toward the equator in the upper atmosphere of the sun, causing the removal of condensed materials to lower and relatively cooler latitudes. Assuming the existence of such currents, we ought to find that successive spots have a tendency to form along the same meridians, for the polar currents would carry the condensed materials to lower latitudes in a nearly meridional direction. The existence of such currents is further supported by the outcurving of the corona at the solar poles as observed in several eclipses Hence, although the existence of these currents has not been definitely proved, there is strong evidence that there exists some circulation of this nature in the solar atmosphere.

When once the falls have commenced, if this hypothesis is true, they should rapidly increase in intensity, for, as it is the falls which increase the temperature of the lower atmosphere by the conversion of their kinetic energy into heat, the more falls there are the more material will be taken first to the poles and then toward the equator, and therefore there will be more available spot-forming material. But we know that this increase in intensity does not go on forever, and there must therefore be some regulating influence. The increase of temperature and possibly of the height of the solar atmosphere, due to the increased falls, will eventually become such that the descending materials are dissociated before they reach the photosphere. The production of spots must therefore gradually diminish until they finally disappear and end the spot cycle. At the minimum period, therefore, pores and veiled spots, due to less powerful energies, are at a maximum.

Records of eclipses, occurring when the sun was quietest, show that the condensing and condensed materials brought to the equator by the polar currents probably extend far beyond the true atmosphere of the sun and are there collected, possibly in the form of a more or less regular ring the section of which widens toward the sun, the widest part being within the boundary of the sun's atmosphere. If we assume such a ring under absolutely stable conditions, there will be no fall of material, and therefore no prominences or spots. But suppose a disturbance caused, as before, by collisions, which most likely occur where the particles brought by the polar currents meet the surface of the ring. These particles then fall from where the ring first meets the atmosphere onto the photosphere, and form the first spots. Eclipse records show that this action takes place about 30° latitude. This is in strict accordance with eclipse observations extending over twenty years. According to this view of the solar economy, the sun ought to give out more heat at a maximum than at a minimum period, when the number of falls is greatest; on this point see the article METEOROLOGY.

The relative nearness of the sun makes it convenient as a type of those stars which on account of their great distance are less accessible to minute observation. The light we receive under present conditions we call white; but, if its own atmosphere and ours were removed or became so changed as to no longer absorb blue light, the sun would appear blue. If, on the other hand, the blue absorption were enormously increased, so that it extended into the green, the sun would appear red, because every other kind of light would be absorbed. If two kinds of absorption—one in the red, the other in the blue—were going on together, as they sometimes do in our laboratories, the sun would then appear green. Although these changes are not of actual occurrence in the sun, we find each of these conditions represented among the stars. In the colored stars, which may be red, green, or blue, we are simply dealing with this kind of absorption phenomena.

The ordinary Fraunhofer spectrum gives the sum total of the line absorptions of all the various layers in the sun's atmosphere, but by examining individual layers just off the edge of the disk we can single out the absorption lines produced by the lower layers. Thus the absorption produced by the hottest layer, the chromosphere—hottest because nearest the photosphere—is indicated by its usually simple radiation spectrum when examined in this way. If the sun were made hotter, therefore, the gases which give the simple chromosphere spectrum would have a larger share in the absorption, and the main features of the Fraunhofer spectrum would be the few dark lines corresponding to these bright ones. This being so, a star which gives practically the same absorption spectrum as the chromosphere of the sun must be hotter than the average temperature of the sun's atmosphere—as hot as the hottest part of it. The bright central part of the sun is not very much less than the whole volume, but it is so much hotter that it gives out thousands of times more light than the atmosphere.

The spectrum of a star, therefore, does not always depend upon its total diameter, but upon the relative diameters of the central mass and the outer atmosphere. It is a question of sectional areas. A further indication of high temperature in the stars is that the few lines which do occur in their spectra are almost the exact counterparts of those which occur in the hottest layer of the sun, hydrogen lines being especially prominent. The passage from class I. to class II. is by no means sudden: there are stars with every gradation of broad and fine lines. It will readily be understood that the stars of class II. are probably not so hot as those belonging to class I., and the change in the spectrum is supposed to be due to new combinations of the original substances, rendered possible by a reduction of temperature; that is, new lines are formed at the expense of the old ones. The hydrogen lines are very prominent in class II., though not so intense as in class I. The stars of these two classes may be grouped together and called hydrogen stars. Stars belonging to class III. exhibit unmistakable evidence of carbon vapor. Sodium and iron are also often present. All the stars in this class, of which fifty-five are known, agree in having a reddish tint. They are usually faint, and seldom exceed the fourth magnitude. There is evidence of the existence of carbon vapor in the sun's atmosphere, depending upon one solitary fluting, and hence stars of this class probably represent what the sun would become if it were cooled. Class III. therefore represents a lower temperature than classes II. and I. Class IV., containing 475 known members, includes the stars giving fluted spectra with the darkest edges of the flutings toward the violet. The origin of the substances of which thay are mainly composed is not at present known. All the principal bands are absolutely unchanging in position, although there is considerable variation in the intensities. The bands in the spectrum appear to result from the rhythmical vibrations of the same substance, probably a complex one. Besides this unknown substance, there are also metallic lines in many of the stars, the complete spectrum consisting of the banded spectrum superposed upon the line spectrum. The metallic lines are generally seen in the spectra of sodium, iron, magnesium, or calcium; the hydrogen lines are very inconspicuous.

These considerations suggest the question of stellar evolution. Comets and nebulæ are now supposed to consist of clouds of stones or small meteorites, and the difference between their spectra may be due to a difference of temperature, that of the nebulæ being highest. Comets ordinarily give the spectrum of carbon, and, if we imagine such cometary matter to surround a central bright nucleus, we have the spectrum of a star of the third class. On the nebular hypothesis, starting with ordinary cometary materials, the small masses resulting from the first condensations gravitate toward each other, and their energy becomes heat by the retardation of their motion on coming in contact. As soon as the condensed mass is hot enough, it gives a fluted spectrum, like stars of the third class. As the energy of condensation increases, the temperature is raised, and the spectrum passes from that of a third class star to that of a second class star, and then to that of a first class star. On the subsequent cooling of what is then a star the successive stages will be again passed through in inverse order. According to this view, we ought to find fewer hydrogen stars than carbon stars, because every star is a carbon star at two periods of its existence, but a hydrogen star only once. On this point, however, nothing definite can be stated, as the stars of classes I. and II. have, in consequence of their greater brightness, received more attention than carbon stars.

In 1866 a star of the tenth magnitude in the constellation Corona suddenly flashed up into a star of nearly the first magnitude; its spectrum as a tenth magnitude star differed from its spectrum as a first or second—the latter containing bright lines of hydrogen. In about a month it again became a tenth magnitude star and appeared as if nothing had happened to it. There can be little doubt that here there was a sudden increase of temperature, as evidenced by the spectrum becoming like that of the chromosphere of the sun. Ten years afterward a new star appeared in Cygnus; it had never been seen before, but appeared suddenly as a third or fourth magnitude star. In about a year it gradually dwindled down to the tenth magnitude, and its spectrum became that of a nebula. This mass was at a stellar distance, but it cannot be considered to have been a large mass of incandescent material, for in that case it would have taken millions of years, instead of only one, to cool down to the tenth magnitude. A possible explanation of most of the new and variable stars is to be found in the meteorite theory: the innumerable components of one group of meteorites colliding with those of another group would be competent to give out light sufficient to make the whole appear as a star. Each meteorite gives only a little light, but the total must be very considerable. The new star in Corona, and similarly all new stars, may have been the result of a collision of two groups of meteorites. They die out quickly because the components are small and far apart. The sudden increase in the brilliancy of the star in Cygnus would be produced by a collision of a meteor swarm with the star already existing.

SUN-BIRD, a name more or less in use for many years, and now generally accepted as that of a group of over 100 species of small birds, but when or by whom it was first applied is uncertain. Most of them are remarkable for their gaudy plumage, and are now fully recognized as forming a valid Family *Nectariniidæ*, from the name *Nectarinia* invented in 1811 by Illiger. They inhabit the Ethiopian, Indian, and Australian regions, and, with some notable exceptions, the species mostly have but a limited range. They are considered to have their nearest allies in the *Meliphagidæ* (*cf.* HONEY-EATER), and the members of the genus Zosterops; but their relations to the last require further investigation. Some of them are called "Humming-birds" by Anglo-Indians and colonists, but with that group, which, as before indicated (HUMMING-BIRD), belongs to the *Picariæ*, the Sun-birds, being true *Passeres*, have nothing to do. Graceful in form and active in motion, Sun-birds flit from flower to flower, feeding chiefly on small insects which are attracted by the nectar; but this is always done while perched, and never on the wing as is the habit of Humming-birds. The extensible tongue, though practically serving the same end in both groups, is essentially different in its quasi-tubular structure, and there is also considerable difference between this organ in the *Nectariniidæ* and the *Meliphagidæ*. The nests of the Sun-birds, domed with the penthouse porch, and pensile from the end of a bough or leaf, are very neatly built. The eggs are generally three in number, of a dull white covered with confluent specks of greenish gray.

SUN-BITTERN, otherwise the CAURÂLE, the *Eurypyga helias* of ornithology, a bird that has long exercised systematists and one whose proper place can scarcely yet be said to have been determined to everybody's satisfaction.

The Sun-Bittern is about as big as a small Curlew, but with much shorter legs and a rather slender, slightly decurved bill, blunt at the tip. The wings are moderate, broad, and rounded, the tail rather long and broad. The head is black with a white stripe over and another under each eye, the chin and throat being also white. The rest of the plumage is not to be described in a limited space otherwise than generally, being variegated with black, brown, chestnut, bay, buff, gray, and white —so mottled, speckled, and belted either in wave-like or zigzag forms as somewhat to resemble certain moths. The bay color forms two conspicuous patches on each wing, and also an antepenultimate bar on the tail, behind which is a subterminal band of black. The irides are red; the bill is greenish olive; and the legs are pale yellow. As in the case of most South American birds, very little is recorded of its habits in freedom, except that it frequents the muddy and wooded banks of rivers, feeding on small fishes and insects. In captivity it soon becomes tame, and has several times made its nest and reared its young (which, when hatched, are clothed with mottled down; *Proc. Zool. Society*, 1866), in the Zoölogical Gardens (London), where examples are generally to be seen and their plaintive piping heard. It ordinarily walks with slow and precise steps, keeping its body in a horizontal position, but at times, when excited, it will go through a series of fantastic performances, spreading its broad wings and tail so as to display their beautiful markings. This species inhabits Guiana and the interior of Brazil; but in Colombia and Central America occurs a larger and somewhat differently colored form which is known as *E. major*.

SUNBURY, the capital of Northumberland county, Penn., is situated on the Susquehanna river at the junction of the Northern Central and Philadelphia and Erie railroads, and is the terminus of the Danville, Hazelton, and Wilkesbarre road. It contains one bank, one daily and two weekly papers, and one grist-mill, two planing-mills, two foundries, one casket factory, three cigar factories, electric light works, also a court-house and county buildings, six churches, brewery, and enterprises of less importance. The population, 4,070 in 1880, was 5,892 in 1890.

SUNDA ISLANDS, the collective name of the whole series of islands in the East Indian Archipelago which extend from the peninsula of Malacca to New Guinea. They are divided into the Great Sunda Islands—*i.e.*, Sumatra, Java, Borneo, Celebes, Banca, and Billiton, with their adjacencies—and the Little Sunda Islands, of which the more important are Bali, Lombok, Sumbawa, Flores, Sandalwood Island, Adanara, Solor, Savu, Pantar, etc.

SUNDA STRAIT is the channel separating Sumatra from Java, and uniting the Indian Ocean with the Java Sea. It is fifteen miles broad between the southmost point of Sumatra and the town of Anjer in Java. Right in the middle is the low-lying well-wooded island of Dwars in den Weg, otherwise Middle Island or Sungian. In 1883 Sunda Strait was the scene of the most terrific results of the eruption of Krakatoa, a volcano on the west side of the strait. The greater part of the island of Krakatoa was destroyed and two new islands, Steers Island and Calmeyer Island, were thrown up.

SUNDARBANS. See GANGES.

SUNDAY, or THE LORD'S DAY (*ἡ τοῦ ἡλίου ἡμέρα, dies Solis; ἡ κυριακὴ ἡμέρα, dies dominica, dies dominicus*). According to all the four evangelists, the resurrection of our Lord took place on the first day of the week after His crucifixion (*ἡ μία [τῶν] σαββάτων*: Matt. xxviii. 1, Mark xvi. 2, Luke xxiv. 1, John xx. 1; *πρώτη σαββατου*: Mark xvi. 9), and the Fourth Gospel describes a second appearance to His disciples as having occurred eight days afterward (John xx. 26). Apart from this central fact of the Christian faith, the Pentecostal outpouring of the Spirit, seven weeks later, described in Acts ii., cannot have failed to give an additional sacredness to the day in the eyes of the earliest converts. Whether the primitive church in Jerusalem had any special mode of observing it in its daily meetings held in the temple (Acts ii. 46) we cannot tell; but as there is no doubt that in these gatherings the recurrence of the Sabbath was marked by appropriate Jewish observances, so it is not improbable that the worship on the first day of the week had also some distinguishing feature. Afterward, at all events, when Christianity had been carried to other places where from the nature of the case daily meetings for worship were impossible, the first day of the week was everywhere set apart for this purpose.

The first writer who mentions the name of Sunday as applicable to the Lord's day is Justin Martyr; this designation of the first day of the week, which is of heathen origin (see SABBATH), had come into general use in the Roman world shortly before Justin wrote. As long as the Jewish Christian element continued to have any prominence or influence in the church, a tendency more or less strong to observe Sabbath as well as Sunday would of course persist. Eusebius (*H.E.*, iii. 27) mentions that the Ebionites continued to keep both days, and there is abundant evidence from Tertullian onward that so far as public worship and abstention from fasting are concerned the practice was widely spread among the Gentile churches.

The earliest recognition of the observance of Sunday as a legal duty is a constitution of Constantine in 321 A.D., enacting that all courts of justice, inhabitants of towns, and workshops were to be at rest on Sunday (*venerabili die Solis*), with an exception in favor of those engaged in agricultural labor. This was the first of a long series of imperial constitutions, most of which are incorporated in the Code of Justinian, bk. iii. tit. 12 (*De Feriis*). The constitutions comprised in this title of the code begin with that of Constantine, and further provide that emancipation and manumission were the only legal proceedings permissible on the Lord's day (*die dominico*), though contracts and compromises might be made between the parties where no intervention of the court was necessary. Pleasure was forbidden as well as business. No spectacle was to be exhibited in a theater or circus. If the emperor's birthday fell on a Sunday, its celebration was to be postponed. The seven days before and after Easter were to be kept as Sundays. After the time of Justinian the observance of Sunday appears to have become stricter. In the West Charlemagne forbade labor of any kind. A century later in the Eastern empire No. liv. of the Leonine constitutions abolished the exemption of agricultural labor contained in the constitution of Constantine. The decrees of ecclesiastical councils on the subject have been very numerous. Works of necessity (especially in the case of perishable materials or where time was important, as in fishing) were allowed, on condition that a due proportion of the gain made by work so done was given to the church and the poor. In England legislation on the subject began early and continues down to the most modern times. In almost all the pre-Conquest compilations there are admonitions to keep the day holy. The first allusion to Sunday in statute law proper is the Act of 28 Edw. III. c. 14 (now repealed), forbidding the sale of wool at the staple on Sunday. The mass of legislation from that date downward may be divided, if not with strict accuracy, at least for purposes of convenience, into five classes—ecclesiastical, constitutional, judicial, social, and commercial.

Before the Reformation there appears to be little or no statutory recognition of Sunday, except as a day on which trade was interdicted or national sports directed to be held. With the Reformation, however, it became necessary to enforce the observance of Sunday by the state in face of the question mooted at the time as to the divine or merely human institution of the day as a holy day. Sunday observance was directed by injunctions of both Edward VI. and Elizabeth, as well as by Acts of Parliament in their reigns. 5 and 6 Edw. VI. c. 1 (the second Act of Uniformity) enacted that all inhabitants of the realm were to endeavor themselves to resort to their parish church or chapel accustomed, or upon reasonable let thereof to some usual place where common prayer is used every Sunday, upon pain of punishment by the censures of the church. This is still law except as to Dissenters (see 9 and 10 Vict. c. 59). The same principle was reënacted in the Act of Uniformity of Elizabeth (1 Eliz. c. 2), with the addition of a temporal punishment, viz., a fine of twelve pence for each offense. This section of the Act is, however, no longer law. At the end of the reign of Elizabeth canon thirteen of the canons of 1603 (which are certainly binding upon the clergy, and probably upon the laity as far as they are not contrary to the law, statutes, and customs of the realm, or the royal prerogative) provided that "all manner of persons within the Church of England shall celebrate and keep the Lord's day, commonly called Sunday, according to God's holy will and pleasure and the orders of the Church of England prescribed in that behalf, that is, in hearing the word of God read and taught, in private and public prayers, in acknowledging their offenses to God and amendment of the same, in reconciling themselves charitably to their neighbors where displeasure hath been, in oftentimes receiving the communion of the body and blood of Christ, in visiting the poor and sick, using all godly and sober conversation." The Long Parliament, as might be expected, occupied itself with the Sunday question. An ordinance of 1644, c. 51, directed the Lord's day to be celebrated as holy, as being the Christian Sabbath. Ordinances of 1650, c. 9, and 1656, c. 15, contained various minute descriptions of crimes against the sanctity of the Lord's day, including traveling and "vainly and profanely walking." The Act of Uniformity of Charles II. (13 and 14 Car. II. c. 4) enforced the reading on every Lord's day of the morning and evening prayer according to the form in the Book of Common Prayer—a duty which had been previously enjoined by canon 14. By the first of the Church Building Acts (58 Geo. III. c. 45, s. 65) the bishop may direct a third service, morning or evening, where necessary, in any church built under the Act. By 1 and 2 Vict. c. 106, s. 80, he may order the performance of two full services, each if he so direct to include a sermon. The Burial Laws Amendment Act, 1880, forbids any burial under the Act taking place on Sunday. Parliament has occasionally sat on Sunday in cases of great emergency, as on the demise of the crown. In one or two cases in recent years divisions in the House of Commons have taken place early on Sunday morning. The Ballot Act, 1872, enacts that in reckoning time for election proceedings Sundays are to be excluded. A similar provision is contained in the Municipal Corporations Act, 1882, as to proceedings under that Act. As a general rule Sunday for the purpose of judicial proceedings is a *dies non*. Proceedings which do not need the intervention of the court are good, *e.g.*, service of a citation or notice to quit or claim to vote. By 11 and 12 Vict. c. 42, s. 4, a justice may issue a warrant of apprehension or a search warrant on Sunday. The rules of the Supreme Court, 1883, provide that the offices of the Supreme Court shall be closed on Sundays, that Sunday is not to be reckoned in the computation of any limited time less than six days allowed for doing any act or taking any proceeding, and that, where the time for doing any act or taking any proceeding expires on Sunday, such act or proceeding is good if done or taken on the next day. By the County Court Rules, 1886, the only county court process which can be executed on Sunday is a warrant of arrest in an Admiralty action.

Under the head of social may be grouped the enactments having for their object the regulation of Sunday traveling and amusements. The earliest example of non-ecclesiastical interference with recreation appears to be the *Book of Sports* issued by James I. in 1618. Royal authority was given to all but recusants to exercise themselves after evening service in dancing, archery, leaping, vaulting, May-games, Whit-sun-ales, morris-dances, and setting up of Maypoles; but bear and bull baiting, interludes, and bowling by the meaner sort were prohibited. In 1625 the first Act of the reign of Charles I. (1 Car. I. c. 1), inhibited meeting, assemblies, or concourse of people out of their own parishes on the Lord's day for any sports and pastimes whatsoever, and any bear-baiting, bull-baiting, interludes, common plays, or other unlawful exercises and pastimes used by any person or persons within their own parishes, under a penalty of 3s. 4d. for every offense. An Act which has had more important consequences in recent years is 21 Geo. III. c. 49 (drawn by Doctor Porteus, bishop of London). It enacts that any place opened or used for public entertainment and amusement or for public debate upon any part of the Lord's day called Sunday, to which persons are admitted by payment of money or by tickets sold for money, is to be deemed a disorderly house. The keeper is to forfeit $1,000 for every day on which it is opened or used as aforesaid on the Lord's day, the manager or master of the ceremonies $500, and every doorkeeper or servant $250. The advertising or publishing any advertisement of such an entertainment is made subject to a penalty of $250. It has been held that a meeting the object of which was not pecuniary gain (though there was a charge for admission), but an honest intention to introduce religious worship, though not according to any established or usual form, was not within the Act. On this principle forms of worship most directly opposed to the prevailing feeling of the country, such as Mormonism or Mohammedanism, are protected. In 1875 actions were brought in the Courts of Queen's Bench and Exchequer against the Brighton Aquarium Company, and penalties recovered under the Act. The Sunday opening of museums and art galleries is governed by local regulations; there is no general law on the subject, though attempts have been made in that direction. The House of Lords recently passed a resolution in favor of the principle. A public billiard table must not be used on Sunday (8 and 9 Vict. c. 109). The Game Act (1 and 2 Will. IV. c. 32, s. 3) makes it punishable with a fine of $25 to kill game or use a dog or net for sporting purposes on Sunday. Provisions for the regulation of street traffic on Sundays during divine service in the metropolis and provincial towns may be made by the local authorities under the powers of the Metropolis Management Acts, the Town Police Clauses Act, and the Public Health Act. Hackney carriages may ply for hire in London (1 and 2 Will. IV. c. 22). Where a railway company runs trains on Sunday one cheap train each way is to be provided (7 and 8 Vict. c. 85, s. 10). Most of the railway companies' own Acts also provide for the running of Sunday trains.

At common law a contract made on Sunday is not void, nor is Sunday trading or labor unlawful. At an early period, however, the legislature began to impose restrictions, at first by making Sunday trade impossible by closing the places of ordinary business, later by declaring certain kinds of trade and labor illegal, still later by attempting to prohibit all trade and labor. The most comprehensive act on the subject is 29 Car. II. c. 7, "An Act for the better observance of the Lord's day, commonly called Sunday." After an exhortation to the observation of the Lord's day by exercises in the duties of piety and true religion, publicly and privately, the act provides as follows: No tradesman, artificer, workman, laborer, or other person whatsoever shall do or exercise any worldly labor, business, or work of their ordinary callings upon the Lord's day or any part thereof (works of necessity and charity only excepted); and every person being of the age of fourteen years or upward offending in the premises shall for every such offense forfeit the sum of 5s.; and no person or persons whatsoever shall publicly cry, show forth, or expose to sale any wares, merchandises, fruit, herbs, goods, or chattels whatsoever upon the Lord's day or any part thereof upon pain that every person so offending shall forfeit the same goods so cried, or showed forth, or exposed to sale (s. 1). No drover, horse-courser, wagoner, butcher, higgler, their or any of their servants, shall travel or come into his or their lodging upon the Lord's day or any part thereof upon pain that each and every such offender shall forfeit 20s. for every such offense; and no person or person shall use, employ, or travel upon the Lord's day with any boat, wherry, lighter, or barge, except it be upon extraordinary occasion to be allowed by some justice of the peace, etc., upon pain that every person so offending shall forfeit and lose the sum of 5s. for every such offense. In default of distress or non-payment of forfeiture or penalty the offender may be set publicly in the stocks for two hours (s. 2). Nothing in the act is to extend to the prohibiting of dressing of meat in families, or dressing or selling of meat in inns, cooks' shops, or victualling houses for such as cannot be otherwise provided, nor to the crying or selling of milk before nine in the morning or after four in the afternoon (s. 3). Prosecutions must be within ten days after the offense (s. 4). The hundred is not responsible for robbery of persons traveling upon the Lord's day (s. 5). Service of process on the Lord's day is void; see above (s. 6). This act has frequently received judicial construction. The use of the word "ordinary" in section 1 has led to the establishment by a series of decisions of the principle that work done out of the course of the ordinary calling of the person doing it is not within the act. Thus the sale of a horse on Sunday by a horse-dealer would not be enforcible by him and he would be liable to the penalty, but these results would not follow in the case of a sale by a person not a horse-dealer. Certain acts were held to fall within the exception as to works of necessity and charity, *e.g.*, baking provisions for customers, running stage-coaches, hiring farm-laborers. The legislature also intervened to obviate some of the inconveniences caused by the act.

Besides the general Act of Charles II., there are various Acts dealing with special trades; of these the Licensing Acts and the Factory and Workshop Act are the most important. The Factory and Workshop Act, 1878, forbids the employment of a child, young person, or woman on Sunday in a factory or workshop. But a young person or woman of the Jewish religion may be employed on Sunday by a Jewish manufacturer, provided that the factory or workshop be not open for traffic on Sunday. There are a few other legislative provisions of less importance which may be noticed. Fishing for salmon on Sunday by any means other than a rod and line is an offense under the Salmon Fishery Act, 1861. By the same Act a free passage for the salmon through all cribs, etc., used for fishery is to be left during the whole of Sunday. Carrying on the business of a pawnbroker on Sunday is an offense within the Pawnbrokers Act, 1872. Distilling and rectifying spirits on Sunday is forbidden by the Spirits Act, 1880. The effect of Sunday upon bills of exchange is declared by the Bills of Exchange Act, 1882. A bill is not invalid by reason only of its bearing date on a Sunday (s. 13). Where the last day of grace falls on a Sunday, the bill is payable on the preceding business day (s. 14). Sunday is a "non-business day" for the purposes of the Act (s. 92). This review of Sunday legislation pretty clearly shows that its tendency at present is opposed to extending facilities to trade on Sunday, but that as to recreation the tendency is rather in the other direction.

The two earliest Acts dealing with Sunday in Scotland are somewhat out of harmony with the general legislation on the subject. 1457, c. 6, ordered the practice of archery on Sunday; 1526, c. 3, allowed markets for the sale of flesh to be held on Sunday at Edinburgh. Then came a long series of Acts forbidding the profanation of the day, especially by salmon-fishing, holding fairs and markets, and working in mills and salt-pans. In more modern times the exigencies of traveling have led to a still further extension of the exception. The Sabbath Observance Acts were frequently confirmed, the last time in 1696. These Acts were held by the High Court of Justiciary in 1870 to be still subsisting, as far as they declare the keeping open shop on Sunday to be an offense by the law of Scotland (Bute's Case, 1 Couper's *Reports*, 495). The forms of certificate in the schedule to the Public Houses Acts Amendment Act, 1862 (superseding those in the Forbes Mackenzie Act of 1853), provide for the closing on Sunday of public-houses and of premises licensed for the sale of excisable liquors, and of inns and hotels, except for the accommodation of lodgers and travelers. Scots law is stricter than English in the matter of Sunday fishing. By the Salmon Fisheries (Scotland) Act, 1862, fishing for salmon on Sunday, even with a rod and line, is an offense. As to contracts and legal process, the law is in general accordance with that of England. Contracts are not void, apart from statute, simply because they are made on Sunday. Diligence cannot be executed, but a warrant of imprisonment or *meditatio fugæ* is exercisable. It should be noticed that, contrary to the English custom, the term "Sabbath" was generally used in the legislation of the Scottish parliament.

Some of the early colonial ordinances enforced the obligation of attendance at church, as in England. In most of the United States there is legislation on the subject of Sunday, following, as a general rule, the lines of the English Act of Charles II. In Massachusetts, traveling, except from necessity or charity, is punishable with a fine of ten dollars. Provision is sometimes made, as in the Massachusetts laws, for the benefit of persons observing Saturday as the Sabbath, on condition that they disturb no other person. The number of Sunday trains is often limited by State legislation. In some of the New England States Sunday is from sunset to sunset. In most States, however, it is reckoned, as in England, from midnight to midnight. By the constitution of the United States, art. I. s. 7, Sundays are to be excluded from the ten days allowed the president to return a Bill. A similar provision is often contained in State constitutions as to the return of a Bill by the governor. The United States legislation on the subject of Sunday is not important. It directs that naval and military studies are not to be pursued, and the day was not formerly reckoned in bankruptcy proceedings.

SUNDERLAND, a municipal and parliamentary borough, market town, and large seaport of Durham, England, is situated at the mouth of the river Wear and on the North-Eastern Railway, twelve miles southeast of Newcastle-on-Tyne and seventy-seven north-northwest of York. Sunderland proper consists chiefly of the High street and other streets near the docks. It is connected with Monkwearmouth by a cast-iron bridge, designed by Rowland Burdon, and consisting of one arch with a span of 236 feet and a height above low water of 100 feet. It was opened in 1796 and widened in 1858. The modern public buildings embrace the custom-house (1837), the Sunderland and North Durham Liberal club in the Ionic style (1839), the corporation offices, the workmen's hall, the new general market, the Victoria hall (1871), the assembly hall, and two theaters. The charitable and benevolent institutions are numerous. For the literary society and subscription library, originally founded in 1793, a new building was erected in 1877. The people's park at Bishopwearmouth, seventeen acres in extent, contains a bronze statue of Sir Henry Havelock, who was born at Ford Hall in the neighborhood. Roker, on the north side of Sunderland, is a favorite bathing-place. The population of the municipal borough (area, 3,306 acres) in 1871 was 98,242, and in 1881 it was 116,542 (males 57,131, females 59,411). The population of the parliamentary borough (area 5,130 acres) in the same years was 104,409 and 124,841 respectively.

Much of the prosperity of Sunderland is due to the coal and limestone in the neighborhood of the river Wear, of which it is the port. Its export of coal began in the reign of Henry VII. The coal trade is still of great importance, and the Monkwearmouth colliery is one of the deepest coal-pits in the world—381 fathoms. Sunderland vies with the Clyde for its iron shipbuilding. The number of iron ships built in 1885 was thirty-one with a tonnage of 30,520 for home, and two with a tonnage of 1,255 for foreigners; of steel ships, nine with a tonnage of 8,099 for home, and three with a tonnage of 3,635 for foreigners. Along both banks of the Wear numerous extensive works of various kinds are situated, including anchor and chain cable works, glass and bottle works, roperies, forges, ironworks, chemical works, paper-mills, breweries, and lime-kilns. The conservation of the port is vested in the Wear commissioners, to whose care the South Dock was transferred by the Wear Navigation and Sunderland Dock Act of 1859. Under their auspices great extensions and improvements have been made, and there are now three large deep-water docks, embracing a total area of forty-three acres. The average annual value of the imports of foreign and colonial merchandise for the five years ending 1886 was a little over $3,500,000, and of the exports of produce of the United Kingdom a little over $3,000,000. The coasting trade, in regard to which specific details are wanting, is, however, more important. The total number of British and foreign vessels, sailing and steam, that entered the port of Sunderland with cargoes or in ballast from foreign countries, British possessions, and coastwise in 1876 was 9,708 of 2,329,576 tons, and in 1885 9,451 of 2,764,174 tons. The numbers that cleared in the same years were respectively 9,430 of 2,357,430 tons, and 9,419 of 2,824,218 tons.

SUNDERLAND, ROBERT SPENCER, SECOND EARL OF, was the eldest son of Henry, the first earl, and Lady Dorothy Sidney, eldest daughter of Robert, second earl of Leicester. He was born in 1640 and succeeded his father (who was killed at Newbury) in the title on September 20, 1643. During the years 1671–73 he acted as ambassador at Madrid, Paris, and Cologne, consecutively, and in 1678 went to Paris as ambassador extraordinary. It was during this period of his life that he acquired that suppleness of feeling and love of finesse which may be traced throughout his subsequent career. From February, 1679, to January, 1681, a period when the country was rent in twain by real or fancied dangers to the Protestant faith, he held the post of secretary of state for the northern department; but his conduct in office was not marked by discretion. Early in 1683, having been reconciled to the duke of York, and having secured a warm friend in the duchess of Portsmouth, Sunderland regained his place as secretary for the northern department. When James II. succeeded to the throne, Sunderland became secretary for the southern department, from March, 1685, to October 27, 1688, for most of which period he held the additional post of president of the council, and was a member of the high commission for ecclesiastical causes. Though Lord Sunderland was in sympathy, if not in actual communion, with Roman Catholicism, he hesitated to commit himself entirely to the acts of the fierce devotees who surrounded James II., and through their opposition he was dismissed in disgrace and sought security in Holland. He died at Althorp September 28, 1702.

SUNDERLAND, CHARLES SPENCER, THIRD EARL OF, was the second son of the second earl, but on the death of his elder brother at Paris, September 5, 1688, he became the heir to the peerage. He was born in 1675, and when twenty years old was sent to the House of Commons by the two constituencies of Hedon in Yorkshire and Tiverton in Devonshire. He chose the latter, and represented it until his succession to the earldom of Sunderland in 1702. Although Sunderland was tinged with republican feeling and had rendered himself personally obnoxious to Anne, he was foisted by the all-powerful influence of his father-in-law, the duke of Marlborough, into the ministry as secretary of state for the southern department. This office he held from December 3, 1706, to June 14, 1710, when he fell, as he rose, through his connection with the duke and duchess of Marlborough. After the accession of George I. he was lord lieutenant of Ireland (1714–15), lord keeper of the privy seal (1715-17), and secretary of state for the northern department (April, 1717, to March, 1718). At the latter date he was raised to the post of prime minister, holding with the office of first lord of the treasury the position of lord president of the council. Lord Sunderland was at the head of affairs during the South Sea mania, and the bursting of the financial bubble led to his political ruin. Through

Walpole's influence he was acquitted of personal corruption, but he was forced to resign his place as first lord of the treasury April 1, 1721. The passion for intrigue which characterized the father had descended to the son; he was ever plotting, and within a few months after Walpole had saved him from disgrace, if not from a worse fate, he was engaged in scheming against the friend who had saved him. But his plots were interrupted by his death, which occurred April 19, 1722.

SUN-FISH. This name is chiefly and properly applied to a marine fish (*Orthagoriscus*) which by its large size, grotesque appearance, and numerous peculiarities of organization has attracted the attention equally of fishermen and of naturalists. Only two species are known—the rough or short sun-fish (*O. mola*), which is found in all seas of the temperate and tropical zones; and the much smaller and scarcer smooth or oblong sun-fish (*O. truncatus*), of which only a small number of specimens have been obtained from the Atlantic and Indian Oceans. That this genus belongs to the order *Plectognathi* and is allied more especially to the globe-fishes (*Diodon* and *Tetrodon*) has been indicated in the article ICHTHYOLOGY, where also the principal anatomical peculiarities have been noticed.

Sun-fishes have the appearance of tailless fish. This is due to the extreme shortening of the tail, which is supported by only a few short vertebræ and reduced to a broad fringe of the trunk. Directly in front of it rise dorsal and anal fins, high and broad, similar to each other in size and triangular in form. The head is completely merged in the trunk, the boundary between them being indicated only by a very small and narrow gill-opening and a comparatively small pectoral fin. This fin can be of but little use in locomotion, and the horizontal and vertical movements of the fish, as well as the maintenance of its body in a vertical position, are evidently executed by the powerful dorsal and anal fins. The small mouth, situated in front of the head, is armed with an undivided dental plate above and below, similar to but weaker than the teeth of the globe-fish (*Diodon*).

Sun-fishes are truly pelagic, propagating their species in the open sea, and only occasionally approach the coast. During the stormy season they live probably at some depth, but in calm bright weather they rise and rest or play on the surface with their dorsal fin high above the water. This habit has given rise to the popular name "sun-fish," a term also sometimes applied to the basking shark, which in like manner enjoys the warmth of a sunny day. The usual size is from 3 to 4 feet in length, but the rough sun-fish attains to 7 feet and more. One of the largest specimens was caught near Portland (Dorsetshire) in 1846, and is now in the British Museum; its length is 7 feet 6 inches. The sun-fish has no economic value, and is rarely, if ever, eaten.

SUNFLOWER. In the modern vernacular this name is most commonly applied to various species of *Helianthus*, especially to *H. annuus;* but, as this is a tropical American herb, and the word "sunflower" or something corresponding to it existed in English literature prior to its introduction, or at any rate prior to its general diffusion in gardens, it is obvious that some other flower than the *Helianthus* must have been intended. The central disk of tubular hermaphrodite flowers, encompassed by the spreading neuter florets of the ray, has, indeed, a marked resemblance to the sun as conventionally depicted. The florets are provided with two or three dry, sharply pointed scales, which serve as pappus, and the whole mass of florets is encircled by a close involucre of leafy bracts. There are numerous varieties of the common sunflower in cultivation, the so-called double form being one in which the ordinarily tubular florets in the center become spreading and "ligulate" like those at the circumference. The seeds, or more strictly speaking the fruits, contain much oil, for which the plant is cultivated in southern Russia. The oil is used in the manufacture of soap. The seeds are also valued for their agreeable flavor, and are much used as food for poultry, etc. The so-called "Jerusalem artichoke" (*Helianthus tuberosus*) belongs to the same genus. It is believed to be a native of Canada, or perhaps a modified form of *H. doronicoides.* The tubers are rich in inulin and sugar, and the plant deserves more attention at the hands of cultivators than it has yet received. The word "Jerusalem" is evidently a corruption, while "artichoke" applies to the flavor of the tuber, which is not unlike that of the artichoke.

SUNNITES AND SHÍ‘ITES The religion of Mohammed is at present professed by 150,000,000 to 200,000,000 souls, spread over great parts of Asia (including the Indian Archipelago), Africa, and southern Europe—over Asia Minor, Armenia, Syria, Palestine, Arabia, Mesopotamia, the Caucasus, Persia, all upper Asia (including Siberia), the steppes of southern Russia, Afghanistan, Beluchistan, Tibet, China, Japan, India, Egypt, the Soudan as far as the equatorial lakes, the whole north coast of Africa and thence deep into the interior, European Turkey, Bulgaria, Bosnia, and Herzegovina. In most of these regions Moslems live side by side with men of other confessions, even where Islam is the ruling creed, it is found unmixed in Central Asia and some parts of Arabia.

Mohammedans fall into the two great divisions of Sunnites and Shí‘ites (Shí‘a), separated by such bitter hatred as belongs to two hostile religions, or such as some Catholic populations feel toward a Protestant The Sunnites, who accept the orthodox tradition (*Sunna*) as well as the Koran as a source of theologico-juristic doctrines, predominate in Arabia, the Turkish empire, the north of Africa, Turkestan, Afghanistan, and the Mohammedan parts of India and the east of Asia; the Shí‘ites, whose origin has been explained in MOHAMMEDANISM, have their main seat in Persia, where their confession is the state religion, but are also scattered over the whole sphere of Islam, especially in India and the regions bordering on Persia, except among the nomad Tartars, who are all nominally Sunnite. Even in Turkey there are many native Shí‘ites, generally men of the upper classes, and often men in high office. The Shí‘ites are less numerous and less important than the Sunnites, but on the whole may amount to 20,000,000.

Orthodox Islam preserves unchanged the form of doctrine established in the tenth century by Abú 'l-Hasan al-Ash‘arí. The attacks of rationalism, aided by Greek philosophy, were repelled and vanquished by the weapons of scholastic dialectic borrowed from the enemy; on most points of dispute discussion was forbidden altogether, and faith in what is written in the Koran and tradition was enjoined without question as to how these things were true (bilá kaifa). Freer allegorical views, however, were admitted on some specially perplexing points, such as the doctrine of the eternity of the Koran, the crude anthropomorphisms of the sacred text, etc.; and, since Mo‘tazilite views had never taken deep root among the masses, while the caliphs required the help of the clergy, and from the time of Motawakkil (847 A.D.) became ever more closely bound to orthodox views, the freethinking tendency was thoroughly put down, and to the present day no rationalizing movement has failed to be crushed in the bud. Philosophy still means no more than scholastic dialectic, and is the humble servant of orthodoxy, no man venturing on devious paths except in secret. In the years 1872 78 the Afghan Jamál al-Dín, a professor in the Azhar mosque at Cairo, attempted to read Avicenna with his scholars, and to exercise them in things that went beyond theology, bringing, for example, a globe into the mosque to explain the form of the earth. But the other professors rose in arms, forbade him to enter the mosque, and in 1879 procured his exile on the pretext that he entertained democratic and revolutionary ideas.

That even in early times the masses were never shaken in their attachment to the traditional faith, with all its crude and grotesque conceptions, is due to the zeal of the ulema, or clergy, for the protection of Islam from every alien influence. Mohammedanism has no priesthood standing between God and the congregation, but Koran and Sunna are full of minute rules for the details of private and civil life, the knowledge of which is necessarily in the hands of a class of professed theologians. These are the *'ulemá* ("knowers," singular *'álim*), theology being briefly named "the knowledge" (*'ilm*). Their influence is still enormous and hardly has a parallel in the history of religions. For it is not supported by temporal agencies like the spiritual authority of the Christian priesthood in the Middle Ages, but is a pure power of knowledge over the ignorant masses, who do nothing without consulting their spiritual advisers. The way in which the ulema are recruited and formed into a hierarchy with a vigorous *esprit de corps* throws an instructive light on the whole subject before us.

The students of theology generally begin their course in early youth, but not seldom in riper years. Almost all come from the lowest orders, a few from the middle classes, and none from the highest ranks of society—a fact which in itself excludes all elements of freer and more refined education. The scholar appears before the president's secretary with his poor belongings tied up in a red handkerchief, and after a brief interrogatory is entered on the list of one of the four orthodox rites—Sháfi'ite, Hanafite, Málikite, and Hanbalite. If he is lucky he gets a sleeping-place within the mosque, a chest to hold his things, and a daily ration of bread. The less fortunate make shift to live outside as best they can, but are all day in the mosque, and are seldom deserted by Moslem charity. Having kissed the hands of the sheikh and teachers of his school, the pupil awaits the beginning of the lectures. For books a few compendiums suffice him. Professors and students gather every morning for the daily prayer; then the professors take their seats at the foot of the pillars of the great court and the students crouch on mats at their feet. The beginner takes first a course in the grammar of classical Arabic. The rules of grammar are read out in the memorial verses of the Ajrúmíya, and the teacher adds an exposition, generally read from a printed commentary. The student's chief task is to know the rules by heart; this accomplished, he is dismissed at the end of the year with a certificate (*ijáza*), entered in his text-book, which permits him to teach it to others. The second year is devoted to dogmatic (*kalám* and *tawhíd*), taught in the same mechanical way. The study of law (*fikh*), which rests on Koran and tradition, is more difficult and complex, and begins, but is often not completed, in the third year. The student had learned the Koran by heart at school and has often repeated it since, but only now is the sense of its words explained to him. Of the traditions of the Prophet he has learned something incidentally in other lectures; he is now regularly introduced to their vast and artificial system. From these two sources are derived all religious and civil laws, for Islam is a political as well as a religious institution.

Besides the three main disciplines the student takes up according to his tastes other subjects, such as rhetoric (*ma'ání wabayán*), logic (*mantik*), prosody (*'arúd*), and the doctrine of the correct pronunciation of the Koran (*kirá'a watajwíd*). After three or four years, fortified with the certificates of his various professors, he seeks a place in a law-court or as a teacher, preacher, cadi, or mufti of a village or minor town, or else one of the innumerable posts of confidence for which the complicated ceremonial of Mohammedanism demands a theologian, and which are generally paid out of pious foundations. A place is not hard to find, for the powerful corporation of the ulema seeks to put its own members into all posts, and, though the remuneration is at first small, the young 'álim gradually accumulates the revenues of several offices. Gifts, too, fall in, and with his native avarice and economy he rises in wealth, position, and reputation for piety. The commonalty revere him and kiss his hand; the rich show him at least outward respect; and even the government treats him as a person to whom consideration is due for his influence with the masses. Yet it is but a small fraction of the ulema of the Moslem world that enjoy even such an education as the Azhar affords. It draws few students from foreign parts, where the local schools are of the poorest kind, except in India, and perhaps in Constantinople.

Except in India, where it is controlled by the government, the organization of the priestly and judicial persons trained in the schools is a compromise between what theological principles dictate and what the state demands. Neither Koran nor Sunna distinguishes between temporal and spiritual powers, and no such distinction was known as long as the caliphs acted in all things as successors of the prophets and heads of the community of the faithful. The theologians tried to uphold the orthodox theory by declaring the sultanate to be subordinate to the imámate or sovereignty of the caliphs, and dependent on the latter especially in all religious matters; but their artificial theories have never modified facts. The various dynasties of sultans (Búyids, Ghaznevids, Seljúks, and finally the Mongols) never paid heed to the caliphs and at length abolished them; but the fall of the theocracy only increased the influence of the clergy, the expounders and practical administrators of that legislation of Koran and Sunna which had become part of the life of the Mohammedan world. The Ottoman sultans still bear the title of "successors of the Prophet," and still find it useful in foreign relations, since there is or may be some advantage in the right of the caliph to nominate the chief cadi (*kádí*) of Egypt and in the fact that the spiritual head of Khiva calls himself only the *nakíb* (vicegerent) of the sultan. In India, too, the sultan owes something perhaps to his spiritual title. But among his own subjects he is compelled to defer to the ulema and has no considerable influence on the composition of that body. And, though the various places of religious dignity are conferred by the sultan, no one can hold office who has not been examined and certified by older ulema, so that the corporation is self propagating, and palace intrigues, though not without influence, can never break through its iron bonds.

The student who has passed his examinations at Constantinople or Cairo may take up the purely religious office of *imám* (president in worship) or *khatib* (preacher) at a mosque. These offices, however, are purely ministerial, are not necessarily limited to students, and give no place in the hierarchy and no particular consideration or social status. On the other hand, he may become a judge or cadi. Every place of any importance has at least one cadi, who is nominated by the government, but has no further dependence on it, and is answerable only to a member of the third class of the ulema, viz., the mufti or pronouncer of *fetwas*. A fetwa is a decision according to Koran and Sunna, but without reasons, on an abstract case of law which is brought before the mufti by appeal from the cadi's judgment or by reference from the cadi himself.

All this gives the judges great private and political influence. But the former is tainted by venality, the plague-spot of the East, which, aggravated by the scantiness of judicial salaries or in some cases by the judge having no salary at all, is almost universal among the administrators of justice. Their political influence, again, which arises from the fusion of private and political law in Koran and Sunna, is highly inconvenient to the state, and often becomes intolerable now that relations with Western States are multiplied. And even in such distant parts as Central Asia the law founded on the conditions of the Prophet's lifetime proves so unsuited to modern life that cases are often referred to civil authorities rather than to canonical jurists. The present sultan seems also to aim at diminishing the power of the ulema by such measures as frequent changes of the sheikhu 'l-islám, though this policy is perhaps less likely to confirm his power than to rob it of its last supports.

The official hierarchy, strong as it is, divides its power with the dervishes.

Several of the chief dervish orders arose in the evil times before and after the invasion of the Mongols: thus ‘Abd al-Kádir al-Jílání (d. 561 A.H.; 1165–66) founded the Kádiríya order, Ahmad al-Rifá'í (d. 578 A.H.; 1182–3) the Rifá'íya, Jalálu 'l-dín Rúmí (see RÚMÍ) the Mawlawíya, Abú 'l-Hasan al-Shádhilí (d. 656 A.H.; 1258) the Shádhilíya, Ahmad al-Badawí (d. 675 A. H.; 1276) the Ahmadíya or Badawíya, an order still very widely spread in Egypt. The modern dervishes have sunk as low as the modern ulema. The idea of absorbed contemplation of the divine being, freed from all earthly conceptions, and of mortification of the flesh in order to become one with God is grossly caricatured in the insane howlings *hu hu* ("he, he") and self-torture with red-hot knives, etc., practiced by the "howling" Rifá'íya and in the dizzy whirling of the "dancing" Mawlawíya. Very pestilent too is their traditional reputation for holiness with the common people, while ecstatic piety easily passes into deceit where it is still generally believed that a saint (*walí*) can work miracles. The wandering dervishes especially, who move constantly from place to place, are noted for all sorts of juggling impostures, by the aid of which, like the Yogis of India, they live at the cost of the people. But they are no longer trusted or held in much esteem even by the populace, whereas the conventual orders are usually regarded as pious and inspired men. Sheikh Ahmad, the founder of the Badawíya, is the national saint of Egypt, and his tomb at Tanta is a great place of pilgrimage. The ulema dislike these rivals, but can do little against their influence.

The extreme Shí‘ite view that ‘Alí is to be regarded as an incarnation of the Godhead maintained its predominance only in times when and places where the opposition to the sovereignty of the Omayyads and ‘Abbásids was intense, or where pantheistic influences from India were at work. From the first there existed also a milder form of Shí‘ite faith, which soon was at open war with the fanatical Ismá‘ílíya and their disciples, the Fátimites and Assassins.

It was through the moderate Shí‘ites that the caliph Ma'mún thought to reconcile his dynasty with the house of ‘Alí, and it was this party that became dominant in Persia in the tenth Christian century under the Búyids. When they conquered Bagdád the Búyids abstained from interfering with the Sunnite orthodoxy of the populations of the capital and Arabian ‘Irák, but the Shí‘ite faith was openly professed in their courts at Rai, Shiráz, and Kirmán. But in the next century the power of the Shí‘ite dynasty crumbled and fell before the Ghaznevids and Seljúks, who as Turks were Sunnites, and repressed the opposing views. In the thirteenth century the Mohammedan East was overrun by the Mongols, who at first were indifferent to all religion, and gave the Persian Shí‘ite perfect liberty; later on the great-grandson of Jenghis Khán, Mohammed Khodahbende Oeljitu (1303–16), himself became a Shí‘ite; nor was the progress of the sect checked by the fall of the dynasty and the conquests of Tímúr (1387), who veiled his religious indifference by proclaiming himself an admirer of ‘Alí. Thus the mass of the Persian population remained Shí‘ites, and the Tímúrides accommodated themselves to the religious feelings of their subjects.

The Ithná-‘Asharíya, or "Twelvers," a sect of the moderate Shí‘ites, have their name from the respect they pay to ‘Alí and his eleven immediate heirs through Fátima, daughter of the prophet. Like all Shí‘ites, they hold that Alí was designated as his successor by Mohammed, and unjustly thrust aside by the three actual caliphs, Abúbekr, ‘Omar, and ‘Othmán.

All other points in which Shí‘ites differ from Sunnites depend on their legitimistic opinions or are accommodations of the rites of Islam to the Persian nationality, or else are petty matters affecting ceremonial. The rejection of the whole Sunnite traditions goes with the repudiation of the caliphs under whose protection these were handed down. An allegorical and mystical interpretation reconciles the words of the Koran with the inordinate respect paid to ‘Alí; the Sunnite doctrine of the uncreated Koran is denied. To the Mohammedan confession "There is no god but God and Mohammed is His ambassador" they add "and ‘Alí is the vicegerent of God" (*walí*, properly "confidant"). There are some modifications in detail as to the four main religious duties of Islam—the prescriptions of ritual purity, in particular, being absurdly exaggerated and made the main duty of the faithful. The prayers are almost exactly the same, but to take part in public worship is not obligatory, as there is at present no legitimate imám whose authority can direct the prayer of the congregation. Pilgrimage to Mecca, to which the Sunnite indwellers of ‘Irák and Arabia oppose difficulties, may be peformed by a hired substitute, or its place can be taken by a visit to the tombs of Shí‘ite saints, *e.g.*, that of ‘Alí at Nejef, of Hosain at Kerbelá, of Rizá at Meshhed, or of the "unstained Fátima" at Kum (Fátima-i-ma'asúm, daughter of Músá, the 7th imám). The Shí‘ites are much the most zealous of Moslems in the worship of saints (real or supposed descendants of ‘Alí) and in pilgrimages to their graves, and they have a characteristic eagerness to be buried in those holy places.

While they naturally reject the four Sunnite schools of jurisprudence, the Shí‘ites also derive all law from the Koran, and their trained clergy (mollahs) are the only class that can give legitimate legal responses. The training of the mollah resembles that of the Sunnite ‘álim. The course at the madrasa embraces grammar, with some rhetoric and prosody, logic, dogmatic, Koran exegesis, tradition, and jurisprudence, and finally some arithmetic and algebra. The best madrasa is at Kerbelá. But the best students of Kerbelá are no match even for the Sunnite disciples of Bokhárá. The scholar discharged from his studies becomes first a simple mollah, *i.e.*, local judge and notary. The place of the Sunnite muftis is filled by certain of the *imám-jum‘a*, *i.e.*, presidents of the chief mosques in the leading towns, who in respect of this function bear the title of *imam mujtehid.* This is a dignity conferred by the tacit consent of people and clergy, and is held at one time only by a very few distinguished men. At the beginning of the nineteenth century there were but five mujtehids in Persia; now they seem to be more numerous. The rivals of the clergy in popular influence are the dervishes, whose show of holiness cloaks an immorality and propensity to crime far exceeding what is found among their brethren in Egypt and Turkey. So it has been for centuries, as appears in Olearius' account of the Calanders of his time (1637). Supported by popular superstition, the Persian dervishes are much more pretentious than those of the West. At the great feasts, especially, they quarter themselves impudently in wealthy houses and deafen the indwellers with their unceasing cry of *Yá hakk* ("O Truth!" the mystical equivalent of "O God!"). The wise and modest dervish who, in Sa‘dí's poems tells the greatest sultan the truth as to the hollowness of his royal state, has degenerated into the half-mad and insolent hanger-on who thrusts himself into audience-chambers and claims the seat of honor beside the grandees. The multitude of these motley vagabonds, some harmless, others dangerous, is explained by the love for idleness, buffoonery, and story-telling, which is even more marked in Persia than in other parts of the East.

The great practical difference between the Sunnite and Shí‘ite communities is that among the former it is only with the upper classes, who are few in number, and with the worse sort of dervishes, that obedience to the precepts of religion is a mere formal profession. Most of the ulema and the middle and lower classes are sincere Moslems. In Persia it is the other way; the praise of religion is always on men's lips, but the inner conviction is that it is all a mockery. The clergy laugh inwardly at their own functions; the educated classes either believe nothing at all or hold secretly to a Súfí pantheism. With the common people it is not the proper precepts of Islam, but the Shí‘ite tenets directed against Sunnites and Jews, that find hearty adherence. As it was long necessary to profess orthodoxy for fear of the Arabs, it came to be an established Shí‘ite doctrine that it is lawful to deny one's faith in case of danger. This "caution" (*takíya*) or "concealment" (*ketmán*) has become a second nature with the Persians. And with this it goes that no one shrinks from secret sins, though outwardly professing the utmost devotion.

Finally, in the year 1848 there broke out a violent reaction against the wretched condition of state and church at a moment when a new succession to the throne had (as is wont) involved great part of the land in anarchy. As early as 1837 a young enthusiast, ‘Alí (son of) Mohammed, imbued with pantheistic and communistic ideas, had begun a peaceable but zealous propaganda. Consistently enough with ultra Shí‘ite principles, he deemed himself inspired by the spirit of God, and claimed to be the Mahdí, the twelfth imám, issued from his obscurity to lead the world to salvation. He took the title of Báb aldín ("portal of the faith"), and his followers are known as Bábís. Báb was a man of profound sincerity and averse to violent measures; he avoided all open polemic against the government, which in turn at first tolerated him in its jealousy of the clergy. In 1844 the too great zeal of his follower Mollah Hosain occasioned Báb's imprisonment; but Hosain and his emissaries continued the propaganda and made many converts in all provinces. When the troubles of 1848 broke out Hosain raised open rebellion in Mazenderán. Terrible conflicts ensued, made only more bitter by the execution of Báb (July 18, 1849). Apparently suppressed, the movement proved that it was not extinct in an attempt to assassinate the sháh in 1852. A new proscription followed; but there is no doubt that Bábism still lives in secrecy, and the universal sympathy felt for the martyr Báb among generously minded Persians may still give it a future.

Less dangerous than these bold communists are the Ishmaelites, direct descendants of the old Ismá‘ilíya, whose nihilist doctrines are now diluted into a harmless doctrine of incarnation. They are pretty numerous in India, at Bombay, Surat, and Burhampur, but hardly are found in Persia.

Despite their mutual feuds, Sunnites and Shí‘ites are at one in their hatred and contempt for the professors of other religions. To reconcile the present decay of Islam and prosperity of the unbeliever with their feelings and convictions, Sunnites and Shí‘ites alike take refuge in the doctrine of a restoration of Islam before the end of the world through the "divinely guided" Mahdí. Theologians have tried by artificial interpretation of Koran and Sunna to fix when and how the Mahdí is to appear, and have concluded that he must be looked for at the close of a century. Of this widespread belief Mohammed Ahmed, the Sudanese Mahdí, availed himself in coming forward in the year 1300 of the Flight (1882–83). Theological opinion is so unsettled as to all the details of the Mahdí's work that, according to trustworthy information, his death has not seriously impaired the impression produced by his victories. In Mecca, for example, in 1885 it was commonly held to be conceivable that the Sudanese fighting in his name might destroy England and the Western powers; and it is possible that the belief in this latest Mahdí has still an important part to play in the Eastern question.

SUNSTROKE (*Heatstroke; Insolation; Coup de Soleil; Thermic Fever*), a term applied to the effects produced upon the central nervous system, and through it upon other organs of the body, by exposure to the sun or to overheated air. Although most frequently observed in tropical regions, this disease occurs also in temperate climates during hot weather. A moist condition of the atmosphere, which interferes with cooling of the overheated body, greatly increases the liability to suffer from this ailment.

It would appear that, while any one exposed to the influence of strong solar heat may suffer from the symptoms of sunstroke, there are certain conditions which greatly predispose to it in the case of individuals. Causes calculated to depress the health, such as previous disease, particularly affections of the nervous system—anxiety, worry, or overwork, irregularities in food, and in a marked degree intemperance—have a powerful predisposing influence, while personal uncleanliness, which prevents among other things the healthy action of the skin, the wearing of tight garments, which impede the functions alike of heart and lungs, and living in overcrowded and insanitary dwellings have an equally hurtful tendency. While attacks of sunstroke are frequently precipitated by exposure, especially during fatigue, to the direct rays of the sun, in a large number of instances they come on under other circumstances. Cases are of not infrequent occurrence among soldiers in hot climates when there is overcrowding or bad ventilation in their barracks, and sometimes several will be attacked in the course of a single night. The same remark applies to similar conditions existing on shipboard. Further, persons whose occupation exposes them to excessive heat, such as stokers, laundry workers, etc., are apt to suffer, particularly in hot seasons.

The symptoms of heatstroke, which obviously depend upon the disorganization of the normal heat-regulating mechanism, as well as of the functions of circulation and respiration, vary in their intensity and likewise to some extent in their form. Three chief types of the disease are usually described.

(1) Heat Syncope. In this form the symptoms are those of exhaustion, with a tendency toward fainting or its actual occurrence. A fully developed attack of this description is usually preceded by sickness, giddiness, some amount of mental excitement followed by drowsiness, and then the passage into the syncopal condition, in which there are pallor and coldness of the skin, a weak, quick, and intermittent pulse, and gasping or sighing respiration. The pupils are often contracted. Death may quickly occur; but if timely treatment is available recovery may take place.

(2) Heat Apoplexy or Asphyxia. In this variety the attack, whether preceded or not by the premonitory symptoms already mentioned, is usually sudden, and occurs in the form of an apoplectic seizure, with great vascular engorgement, as seen in the flushed face, congested eyes, quick full pulse, and stertorous breathing. There is usually insensibility, and convulsions are not infrequent. Death is often very sudden. This form, however, is also amenable to treatment.

(3) Ardent Thermic Fever. This variety is characterized chiefly by the excessive development of fever (hyperpyrexia), the temperature of the body rising at such times to 108° to 110° Fahr. or more. Accompanying this are the other symptoms of high febrile disturbance, such as great thirst, quick full pulse, pains throughout the body, headache, nausea, and vomiting, together with respiratory embarrassment. After the attack has lasted for a variable period, often one or two days, death may ensue from collapse or from the case assuming the apoplectic form already described. But here, too, treatment may be successful if it is promptly applied.

Besides these, other varieties depending on the prominence of certain symptoms are occasionally met with. The chief changes in the body after death from heatstroke are those of anæmia of the brain and congestion of the lungs, together with softness of the heart and of the muscular tissues generally. The blood is dark and fluid, and the blood corpuscles are somewhat altered in shape. Attacks of sunstroke are apt to leave traces of their effects upon the constitution, especially upon the nervous system. A liability to severe headache, which in many cases would seem to depend upon a condition of chronic meningitis, epileptic fits, mental irritability, and alterations in the disposition are among the more important. The mortality from sunstroke is estimated at from 40 to 50 per cent.

The treatment of a patient suffering from an attack necessarily depends upon the form it has assumed. In all cases he should if possible be at once removed into a shaded or cool place. Where the symptoms are mostly those of syncope and there is a tendency to death from heart failure, rest in the recumbent position, the use of diffusible stimulants, such as ammonia or ether, etc., together with friction or warmth applied to the extremities, are the means to be adopted. Where, on the other hand, the symptoms are those of apoplexy or hyperpyrexia, by far the most successful results are obtained by the use of cold (the cold affusion, rubbing the surface with ice, enemata of ice-cold water). The effect is a marked lowering of the temperature, while at the same time a stimulus is given to the respiratory function. Mustard or turpentine applied to the nape of the neck or chest is a useful adjuvant. Should the temperature be lowered in this way but unconsciousness still persist, removal of the hair and blistering the scalp are recommended. The subsequent treatment will depend upon the nature of the resulting symptoms.

SUPERIOR CITY. See WEST SUPERIOR.

SUPERIOR, LAKE. See LAKE and ST. LAWRENCE.

SURABAYA. (See JAVA.) The population in 1880 was 122,234.

SURAKARTA, or SOLO. (See JAVA.) Its population was 124,041 in 1880.

SURAT, a district of British India, in the Guzerat division of Bombay presidency, lying between 20° 15′ and 21° 28′ N. latitude and 72° 38′ and 73° 30′ E. longitude. It has an area of 1,662 square miles, and is bounded on the north by Broach district and the native state of Baroda; on the east by the states of Rájpipla, the Gáikwár Bánsda, and Dharampur; on the south by Thána district and the Portuguese territory of Daman; and on the west by the Arabian Sea. It has a coastline of eighty miles, consisting of a barren stretch of sand drift and salt marsh; behind that is a rich, highly cultivated plain, nearly sixty miles in breadth at the embouchure of the Tápti, but narrowing to only fifteen miles in the southern part; and on the northeast are the wild hills and jungle of the Dangs. The only important rivers are the Tápti and the Kim, the former of which is ordinarily navigable for native craft of from eighteen to thirty-six tons. The district contains a large number of tanks for irrigation; and a canal is projected from the Tápti with head works at Kamlápur, thirty-five miles from Surat. The fauna of the district consists of a few tigers, stragglers from the jungles of Bánsda and Dharampur, besides leopards, bears, wild boars, wolves, hyenas, spotted deer, and antelopes. The climate of Surat varies with the distance from the sea. The Bombay, Baroda, and Central India railway runs through the district from north to south. A magnificent iron-girder bridge crosses the Tápti at Surat city.

The census of 1881 returned the population of Surat at 614,198 (306,015 males, 308,183 females), of whom Hindus numbered 415,031, Mohammedans 55,547, Parsis 12,593, and aboriginals 118,664. There are only two towns in the district with a population exceeding 5,000—namely, SURAT (*q.v.*) and Bulsar (13,229). The cultivated area in 1884–85 was returned at 726,583 acres, and the area available for cultivation at 81,663. The total area of crops in 1884–85 was 550,233 acres, including 66,096 twice cropped. Rice occupied 103,972 acres, wheat 38,617, and *joár* 108,644; cotton is also largely cultivated, and its culture is greatly increasing. Grain, cotton, timber, oil, sugar and molasses, and piece goods are the chief articles of export. Almost the whole female population is engaged in spinning cotton thread, and the weaving of cotton cloth in hand looms is carried on in the chief towns; silk is also manufactured in considerable quantities, as well as brocades and embroidery. In 1884–85 the revenue of the district amounted to $18,903,050, of which the land-tax contributed $1,346,220. Surat was one of the earliest parts of India brought into close relations with European countries, and its history merges almost entirely into that of its capital, long the greatest maritime city of the peninsula.

SURAT, capital and administrative headquarters of the above district, is situated in 21° 9′ 30″ N. latitude and 72° 54′ 15″ E. longitude, on the southern bank of the Tápti, distant from the sea fourteen miles by water and ten by land. During the eighteenth century it probably ranked as the most populous city of India, its population being at one time estimated as high as 800,000; but with the transfer of its trade to Bombay the numbers rapidly fell off, until in 1847 its inhabitants numbered only 80,000. Thenceforward the city began to retrieve its position, and in 1881 its population numbered 107,154 (54,524 males and 52,630 females).

SURBITON, a suburb of Kingston in Surrey, England, is finely situated on the river Thames, twelve miles southwest of London by the London and South-Western railway. It consists chiefly of villa residences embosomed in woods and gardens. Along the river an esplanade has been constructed, forming a pleasant promenade. The population of the urban sanitary district (area, 1,000 acres) in 1871 was 7,642, and in 1881 it was 9,406.

SURETY, in law, is the party liable under a contract of GUARANTEE, (*q.v.*) In criminal practice sureties bound by RECOGNIZANCE (*q.v.*) are a means of obtaining compliance with the order of a court of justice, whether to keep the peace or otherwise.

SURFACE, CONGRUENCE, COMPLEX. In plane geometry the elementary figures are the point and the line; and we then have the curve, which may be regarded as a singly infinite system of points, and also as a singly infinite system of lines. In solid geometry the elementary figures are the point, the line, and the plane; we have, moreover, first, that which under one aspect is the curve and under another aspect the developable (or torse), and which may be regarded as a singly infinite system of points, of lines, or of planes; and secondly, the surface, which may be regarded as a doubly infinite system of points or of planes, and also as a special triply infinite system of lines. (The tangent lines of a surface are a special complex.) As distinct particular cases of the first figure we have the plane curve and the cone, and as a particular case of the second figure the ruled surface, regulus, or singly infinite system of lines; we have, besides, the congruence or doubly infinite system of lines, and the complex or triply infinite system of lines. And thus crowds of theories arise which have hardly any analogues in plane geometry; the relation of a curve to the various surfaces which can be drawn through it, and that of a surface to the various curves which can be drawn upon it, are different in kind from those which in plane geometry most nearly correspond to them—the relation of a system of points to the different curves through them and that of a curve to the system of points upon it. In particular, there is nothing in plane geometry to correspond to the theory of the curves of curvature of a surface. Again, to the single theorem of plane geometry, that a line is the shortest distance between two points, there correspond in solid geometry two extensive and difficult theories—that of the geodesic lines on a surface and that of the minimal surface, or surface of minimum area, for a given boundary. And it would be easy to say more in illustration of the great extent and complexity of the subject.

A surface may be regarded as the locus of a doubly infinite system of points—that is, the locus of the system of points determined by a single equation. The degree n of the equation is the order of the surface; and this definition of the order agrees with the geometrical one, that the order of the surface is equal to the number of the intersections of the surface by an arbitrary line.

Mention has been made of the plane curve and the cone; it is proper to recall that the *order* of a plane curve is equal to the number of its intersections by an arbitrary line (in the plane of the curve), and that its *class* is equal to the number of tangents to the curve which pass through an arbitrary point (in the plane of the curve). The cone is a figure correlative to the plane curve: corresponding to the plane of the curve we have the vertex of the cone, to its tangents the generating lines of the cone, and to its points the tangent planes of the cone.

Consider now a surface in connection with an arbitrary line. The line meets the surface in a certain number of points, and, as already mentioned, the *order* of the surface is equal to the number of these intersections. We have through the line a certain number of tangent planes of the surface, and the *class* of the surface is equal to the number of these tangent planes.

But, further, through the line imagine a plane; this meets the surface in a curve the order of which is equal (as is at once seen) to the order of the surface. Again, on the line imagine a point; this is the vertex of a cone circumscribing the surface, and the class of this cone is equal (as is at once seen) to the class of the surface.

The complete enumeration and discussion of the singularities of a surface is a question of extreme difficulty which has not yet been solved. A plane curve has point singularities and line singularities; corresponding to these we have for the surface isolated point singularities and isolated plane singularities, but there are besides continuous singularities applying to curves on or torses circumscribed to the surface, and it is among these that we have the non-special singularities which play the most important part in the theory.

As regards isolated singularities, it will be sufficient to mention the point singularity of the conical point (or cnicnode) and the corresponding plane singularity of the conic of contact (or cnictrope). In the former case we have a point such that the consecutive points, instead of lying in a tangent plane, lie on a quadric cone, having the point for its vertex; in the latter case we have a plane touching the surface along a conic; that is, the complete intersection of the surface by the plane is made up of the conic taken twice and of a residual curve of the order $n-4$.

A ruled surface or regulus is the locus of a singly infinite system of lines, where the consecutive lines do not intersect; this is a true surface, for there is a doubly infinite series of tangent planes—in fact any plane through any one of the lines is a tangent plane of the surface, touching it at a point on the line, and in such wise that, as the tangent plane turns about the line, the point of contact moves along the line. The complete intersection of the surface by the tangent plane is made up of the line counting once and of a residual curve of the order $n-1$. A quadric surface is a regulus in a twofold manner, for there are on the surface two systems of lines each of which is a regulus. A cubic surface may be a regulus.

Congruences and Complexes.—A congruence is a doubly infinite system of lines. A line depends on four parameters and can therefore be determined so as to satisfy four conditions; if only two conditions are imposed on the line we have a doubly infinite system of lines or a congruence. For instance, the lines meeting each of two given lines form a congruence.

A complex is a triply infinite system of lines—for instance, the tangent lines of a surface. Considering an arbitrary point in connection with the complex, the complex lines which pass through the point form a cone; considering a plane in connection with it, the complex lines which lie in the plane envelope a curve. It is easy to see that the class of the curve is equal to the order of the cone; in fact each of these numbers is equal to the number of complex lines which lie in an arbitrary plane and pass through an arbitrary point of that plane.

Curves of Curvature; Asymptotic Lines.—The normals of a surface form a congruence. In any congruence the lines consecutive to a given congruence line do not in general meet this line; but there is a determinate number of consecutive lines which do meet it; or, attending for the moment to only one of these, say the congruence line is met by a consecutive congruence line. In particular, each normal is met by a consecutive normal; this again is met by a consecutive normal, and so on. That is, we have a singly infinite system of normals each meeting the consecutive normal, and so forming a torse; starting from different normals successively, we obtain a singly infinite system of such torses. But each normal is in fact met by two consecutive normals, and, using in the construction first the one and then the other of these, we obtain two singly infinite systems of torses each intersecting the given surface at right angles. In other words, if in place of the normal we consider the point on the surface, we obtain on the surface two singly infinite systems of curves such that for any curve of either system the normals at consecutive points intersect each other; moreover, for each normal the torses of the two systems intersect each other at right angles; and therefore for each point of the surface the curves of the two systems intersect each other at right angles. The two systems of curves are said to be the curves of curvature of the surface.

The normal is met by the two consecutive normals in two points which are the centers of curvature for the point on the surface; these lie either on the same side of the point or on opposite sides, and the surface has at the point in question like curvatures or opposite curvatures in the two cases respectively.

In immediate connection with the curves of curvature we have the so-called asymptotic curves (Haupt-tangentenlinien). The tangent plane at a point of the surface cuts the surface in a curve having at that point a node. Thus we have at the point of the surface two directions of passage to a consecutive point, or, say, two elements of arc; and, passing along one of these to the consecutive point, and thence to a consecutive point, and so on, we obtain on the surface a curve. Starting successively from different points of the surface we thus obtain a singly infinite system of curves; or, using first one and then the other of the two directions, we obtain two singly infinite systems of curves, which are the curves above referred to. The two curves at any point are equally inclined to the two curves of curvature at that point, or—what is the same thing—the supplementary angles formed by the two asymptotic lines are bisected by the two curves of curvature. In the case of a quadric surface the asymptotic curves are the two systems of lines on the surface.

Geodesic Lines.—A geodesic line (or curve) is a shortest curve on a surface; more accurately, the element of arc between two consecutive points of a geodesic line is a shortest arc on the surface. We are thus led to the fundamental property that at each point of the curve the osculating plane of the curve passes through the normal of the surface.

SURGEONS, College of. See Societies.

SURGERY in all countries is as old as human needs. A certain skill in the stanching of blood, the extraction of arrows, the binding up of wounds, the supporting of broken limbs by splints, and the like, together with an instinctive reliance on the healing power of the tissues, has been common to men everywhere. In both branches of the Aryan stock surgical practice (as well as medical) reached a high degree of perfection at a very early period. But there are certainly some dexterous operations described in Susruta (such as the rhinoplastic) which were of native invention; the elaborate and lofty ethical code appears to be of pure Brahmanical origin; and the very copious materia medica (which included arsenic, mercury, zinc, and many other substances of permanent value) does not contain a single article of foreign source. There is evidence that the East enjoyed a proverbial reputation for medical and surgical wisdom at the time of Alexander's invasion. We may give the first place, then, to the eastern branch of the Aryan race in a sketch of the rise of surgery, leaving as insoluble the question of the date of the Sanskrit compendiums or compilations which pass under the names of two representative persons, Charaka and Susruta (the dates assigned to these ranging as widely as 500 years on each side of the Christian era).

The *Susruta* speaks throughout of a single class of practitioners who undertook both surgical and medical cases. Nor were there any fixed degrees or orders of skill within the profession; even lithotomy, which at Alexandria was assigned to specialists, was to be undertaken by any one, the leave of the rajah having been first obtained. The only distinction recognized between medicine and surgery was in the inferior order of barbers, nail-trimmers, ear-borers, tooth-drawers, and phlebotomists, who were outside the Brahmanical caste.

Susruta describes more than one hundred surgical instruments, made of steel. There were fourteen varieties of bandage. The favorite form of splint was made of thin slips of bamboo bound together with string and cut to the length required. Wise says that he has frequently used "this admirable splint," particularly for fractures of the thigh, humerus, radius, and ulna, and it has been subsequently adopted in the English army under the name of the "patent rattan-cane splint."

Fractures were diagnosed, among other signs, by crepitus. Dislocations were elaborately classified, and the differential diagnosis given; the treatment was by traction and countertraction, circumduction, and other dexterous manipulations. Wounds were divided into incised, punctured, lacerated, contused, etc. Cuts of the head and face were sewed. Skill in extracting foreign bodies was carried to a great height, the magnet being used for iron particles under certain specified circumstances. Inflammations were treated by the usual antiphlogistic regimen and appliances, venesection was practiced at several other points besides the bend of the elbow; leeches were more often resorted to than the lancet; cupping also was in general use. Poulticing, fomenting, and the like were done as at present. Amputation was done now and then, notwithstanding the want of a good control over the hemorrhage; boiling oil was applied to the stump, with pressure by means of a cup-formed bandage, pitch being sometimes added. Tumors and enlarged lymphatic glands were cut out, and an arsenical salve applied to the raw surfaces to prevent recurrence. Abdominal dropsy and hydrocele were treated by tapping with a trocar; and varieties of hernia were understood, omental hernia being removed by operation on the scrotum. Aneurisms were known, but not treated; the use of the ligature on the continuity of an artery, as well as on the cut end of it in a flap, is the one thing that the modern surgeon will miss somewhat noticeably in the ancient surgery of the Hindus; and the reason of their backwardness in that matter was doubtless their want of familiarity with the course of the arteries and the arterial circulation. Besides the operation already mentioned, the abdomen was opened by a short incision below the umbilicus slightly to the left of the middle line, for the purpose of removing intestinal concretions or other obstruction (laparotomy). Only a small segment of the bowel was exposed at one time; the concretion when found was removed, the intestine stitched together again, anointed with ghee and honey, and returned into the cavity. Lithotomy was practiced, without the staff. There was a plastic operation for the restoration of the nose, the skin being taken from the cheek adjoining, and the vascularity kept up by a bridge of tissue. The ophthalmic surgery included extraction of cataract. Obstetric operations were various, including cæsarean section and crushing the fœtus.

The medication and constitutional treatment in surgical cases were in keeping with the general care and elaborateness of their practice, and with the copiousness of their materia medica.

The Chinese appear to have been far behind the Hindus in their knowledge of medicine and surgery, notwithstanding that China profited at the same time as Tibet by the missionary propagation of Buddhism. Surgery in particular had hardly developed among them beyond the merest rudiments, owing to their religious respect for dead bodies and their unwillingness to draw blood or otherwise interfere with the living structure. Their anatomy and physiology have been from the earliest times unusually fanciful, and their surgical practice has consisted almost entirely of external applications.

Cupping-vessels made of cow-horn have been found in ancient Egyptian tombs. On monuments and the walls of temples are figures of patients bandaged, or undergoing operation at the hands of surgeons. In museum collections of Egyptian antiquities there are lancets, forceps, knives, probes, scissors, etc. Ebers interprets a passage in the papyrus discovered by him as relating to the operation of cataract. Surgical instruments for the ear are figured, and artificial teeth have been found in mummies. Mummies have also been found with well-set fractures. Herodotus describes Egypt, notwithstanding its fine climate, as being full of medical practitioners, who were all "specialists." The ophthalmic surgeons were celebrated, and practiced at the court of Cyrus.

As in the case of the Sanskrit medical writings, the earliest Greek compendiums on surgery bear witness to a long organic growth of knowledge and skill through many generations. In the Homeric picture of society the surgery is that of the battlefield, and it is of the most meager kind. Between that primitive state of civilization and the date of the first Greek treatises there had been a long interval of gradual progress. The surgery of the *Hippocratic Collection* (age of Pericles) bears every evidence of finish and elaboration. The two treatises on fractures and on dislocations respectively are hardly surpassed in some ways by the writings of the present mechanical age.

Between the Hippocratic era and the founding of the school of Alexandria (about 300 B.C.), there is nothing of surgical progress to dwell upon. The Alexandrian epoch stands out prominently by reason of the enthusiastic cultivation of human anatomy—there are allegations also of vivisection—at the hands of Herophilus and Erasistratus. The sum and substance of this movement appears to have been precision of diagnosis (not unattended with pedantic minuteness), boldness of operative procedure, subdivision of practice into a number of specialties, but hardly a single addition to the stock of physiological or pathological ideas, or even to the traditional wisdom of the Hippocratic time.

The treatise of Celsus *De re medica* (reign of Augustus) reflects the state of surgery in the ancient world for a period of several centuries: it is the best record of the Alexandrian practice itself, and it may be taken to stand for the Roman practice of the period following. Great jealousy of Greek medicine and surgery was expressed by many of the Romans of the republic, notably by Cato the Elder (234–149 B.C.), who himself practiced on his estate according to the native traditions. His medical observations are given in *De re rustica.* In reducing dislocations he made use of the following incantation: "Huat hanat ista pista sista damiato damnaustra." The first Greek surgeon who established himself in Rome is said to have been Archagathus, whose fondness for the knife and cautery at length led to his expulsion by the populace. It was in the person of Asclepiades, the contemporary and friend of Cicero, that the Hellenic medical practice acquired a permanent footing in Rome. This eloquent and plausible Greek confined his practice mostly to medicine, but he is credited with practicing the operation of tracheotomy. He is one of those whom Tertullian quotes as abandoning themselves to vivisections for the gratification of their curiosity: The next figure in the surgical history is Celsus, who devotes the 7th and 8th books of his *De re medica* exclusively to surgery. There is not much in these beyond the precepts of the Brahmanical sâstras and the maxims and rules of Greek surgery.

Galen's practice of surgery was mostly in the early part of his career (born 131 A.D.), and there is little of special surgical interest in his writings, great as their importance is for anatomy, physiology, and the general doctrines of disease. Among the operations credited to him are resection of a portion of the sternum for caries and ligature of the temporal artery. It may be assumed that surgical practice was in a flourishing condition all through the period of the empire from the accounts preserved by Oribasius of the great surgeons Antyllus, Leonides, Rufus, and Heliodorus.

Whatever progress or decadence surgery may have experienced during the next three centuries is summed up in the authoritative treatise of Paulus of Ægina (650). Of his seven books the sixth is entirely devoted to operative surgery, and the fourth is largely occupied with surgical diseases.

It is obviously impossible in a brief space to convey any notion of the comprehensiveness of the surgery of Paulus; his sixth book, with the peculiarly valuable commentary of Adams, brings the whole surgery of the ancient world to a focus; and it should be referred to at first hand.

The Arabians have hardly any greater merit in medicine than that of preserving intact the bequest of the ancient world. To surgery in particular their services are small.

For the 500 years following the work of Paulus of Ægina there is nothing to record but the names of a few practitioners at the court and of imitators or compilers. Meanwhile in western Europe (apart from the Saracen civilization) a medical school had gradually grown up at Salerno, which in the tenth century had already become famous. The hôtel Dieu of Lyons had been founded in 560, and that of Paris a century later. The school of Montpellier was founded in 1025, and became the rallying point of Arabian and Jewish learning. A great name in the history of mediæval surgery is that of Lanfranchi of Milan, who migrated (owing to political troubles) first to Lyons and then to Paris. He distinguished between arterial and venous hemorrhage, and is said to have used the ligature for the former. Contemporary with him in France was Henri de Mondeville of the school of Montpellier, whose teaching is best known through that of his more famous pupil Guy de Chauliac; the *Chirurgie* of the latter bears the date of 1363, and marks the advance in precision which the revival of anatomy by Mondino had made possible. Eighteen years before Lanfranchi came to Paris a college of surgeons was founded there (1279) by Pitard, who had accompanied St. Louis to Palestine as his surgeon. The college was under the protection of St. Cosmas and St. Damianus, two practitioners of medicine who suffered martyrdom in the reign of Diocletian, and it became known as the Collége de St. Côme. From the time that Lanfranchi joined it it attracted many pupils. It maintained its independent existence for several centuries, alongside the medical faculty of the university; the corporation of surgeons in other capitals, such as those of London and Edinburgh, were modeled upon it.

The fourteenth and fifteenth centuries are almost entirely without interest for surgical history. The dead level of tradition is broken first by two men of originality and genius, Paracelsus and Paré, and by the revival of anatomy at the hands of Vesalius and Fallopius, professors at Padua. Apart from the mystical form in which much of his teaching was cast, Paracelsus has great merits as a reformer of surgical practice. Somewhat later in date, and of much greater concrete importance for surgery than Paracelsus, is Ambroise Paré (1517–1590). He began life as apprentice to a barber-surgeon in Paris and as a pupil at the hôtel Dieu. His earliest opportunities were in military surgery during the campaign of Francis I. in Piedmont. Instead of treating gunshot wounds with hot oil, according to the practice of the day, he had the temerity to trust to a simple bandage; and from that beginning he proceeded to many other developments of rational surgery. In 1545 he published at Paris *La méthode de traicter les playes faictes par hacquebutes et aultres bastons à feu.* The same year he began to attend the lectures of Sylvius, the Paris teacher of anatomy, to whom he became prosector; and his next book was an *Anatomy* (1550). His most memorable service was to get the use of the ligature for large arteries generally adopted, a method of controlling the hæmorrhage which made amputation on a large scale possible for the first time in history. Like Paracelsus, he writes simply and to the point in the language of the people, while he is free from the incumbrance of mystical theories, which detract not a little from the merits of his fellow-reformer in Germany. It is only in his book on monsters, written toward the end of his career, that he shows himself to have been by no means free from superstition. Paré was adored by the army and greatly esteemed by successive French kings; but his innovations were opposed, as usual, by the faculty, and he had to justify the use of the ligature as well as he could by quotations from Galen and other ancients.

Surgery in the sixteenth century recovered much of the dexterity and resource that had distinguished it in the best periods of antiquity, while it underwent the developments opened up to it by new forms of wounds inflicted by new weapons of warfare. The use of the staff and other instruments of the "apparatus major" was the chief improvement in lithotomy. A "radical cure" of hernia by sutures superseded the old application of the actual cautery. The earlier modes of treating stricture of the urethra were tried; plastic operations were once more done with something like the skill of Brahmanical and classical times; and ophthalmic surgery was to some extent rescued from the hands of ignorant pretenders. It is noteworthy that even in the legitimate profession dexterous special operations were kept secret; thus the use of the "apparatus major" in lithotomy was handed down as a secret in the family of Laurence Colot, a contemporary of Paré's.

The seventeenth century was distinguished rather for the rapid progress of anatomy and physiology, for the Baconian and Cartesian philosophies, and the keen interest taken in complete systems of medicine, than for a high standard of surgical practice. The teaching of Paré that gunshot wounds were merely contused and not poisoned, and that simple treatment was the best for them, was enforced anew by Magati (1579–1647), Wiseman, and others. Trephining was freely resorted to, even for inveterate migraine; Philip William, prince of Orange, is said to have been trephined seventeen times. Flap-amputations, which had been practiced in the best period of Roman surgery by Leonides and Heliodorus, were introduced by Lowdham, an Oxford surgeon, in 1679, and probably used by Wiseman, who was the first to practice the primary major amputations. Fabriz von Hilden (1560–1634) introduced a form of tourniquet, made by placing a piece of wood under the bandage encircling the limb; out of that there grew the block-tourniquet of Morel, first used at the siege of Besançon in 1674; and this, again, was superseded by Jean Louis Petit's screw-tourniquet in 1718. Strangulated hernia, which was for long avoided as a *noli me tangere*, became a subject of operation. Lithotomy by the lateral method came to great perfection in the hands of Jacques Beaulieu.

To this century also belong the first indications (not to mention the Alexandrian practice of Ammonius) of crushing the stone in the bladder. The theory and practice of transfusion of blood occupied much attention, especially among the busy spirits of the Royal Society, such as Boyle, Lower, and others. The seat of cataract in the substance of the lens was first made out by two French surgeons, Quarré and Lasnier. Perhaps the most important figure in the surgical history of the century is Richard Wiseman, the father of English surgery. Wiseman took the Royalist side in the wars of the Commonwealth, and was surgeon to James I. and Charles I., and accompanied Charles II. in his exile in France and the Low Countries. After serving for a time in the Spanish fleet, he joined the Royalist cause in England and was taken prisoner at the battle of Worcester. At the restoration he became serjeant-surgeon to Charles II., and held the same office under James II. His *Seven Chirurgical Treatises* were first published in 1676, and went through several editions; they relate to tumors, ulcers, diseases of the anus, king's evil (scrofula), wounds, fractures, luxations, and lues venerea. Wiseman was the first to advocate primary amputation (or operation before the onset of fever) in cases of gunshot wounds and other injuries of the limbs. He introduced also the practice of treating aneurisms by compression, gave an accurate account of fungus articulorum, and improved the operative procedure for hernia.

The eighteenth century marks the establishment of surgery on a broader basis than the skill of individual surgeons of the court and army, and on a more scientific basis than the rule of thumb of the multitude of barber-surgeons and other inferior orders of practitioners. In Paris the Collége de St. Côme gave way to the Academy of Surgery in 1731, with Petit as director, to which was added at a later date the École Pratique de Chirurgie, with Chopart and Desault among its first professors. The Academy of Surgery set up a very high standard from the first, and exercised great exclusiveness in its publications and its honorary membership. In London and Edinburgh the development of surgery proceeded on less academical lines, and with greater scope for individual effort. Private dissecting rooms and anatomical theaters were started, of which perhaps the most notable was Dr. William Hunter's school in Great Windmill street, London, inasmuch as it was the first perch of his more famous brother John Hunter. In Edinburgh, Alexander Monro, first of the name, became professor of anatomy to the company of surgeons in 1719, transferring his title and services to the university the year after; as he was the first systematic teacher of medicine or surgery in Edinburgh, he is regarded as the founder of the famous medical school of that city. In both London and Edinburgh a company of barbers and surgeons had been in existence for many years before; but it was not until the association of these companies with the study of anatomy, comparative anatomy, physiology, and pathology that the surgical profession began to take rank with the older order of physicians. Hence the significance of the eulogy of a living surgeon on John Hunter: "more than any other man he helped to make us gentlemen" (*Hunterian Oration*, 1877). The state of surgery in Germany may be inferred from the fact that the teaching of it at the new university of Göttingen was for long in the hands of Haller, whose office was "professor of theoretical medicine." In the Prussian army it fell to the regimental surgeon to shave the officers. At Berlin a medico-chirurgical college was founded by surgeon-general Holtzendorff in 1714, to which was joined in 1726 a school of clinical surgery at the Charité. Military surgery was the original purpose of the school, which still exists, side by side with the surgical cliniques of the faculty, as the Friedrich Wilhelm's Institute. In Vienna, in like manner, a school for the training of army surgeons was founded in 1785—Joseph's Academy or the Josephinum. The first systematic teaching of surgery in the United States was by Doctor Shippen at Philadelphia, where the medical college toward the end of the century was largely officered by pupils of the Edinburgh school. Without attempting to enumerate the great names in surgery during the eighteenth century, it will be possible to introduce the more prominent of them in a brief sketch of the additions to the ideas and resources of surgery in that period.

A great part of the advance was in surgical pathology, including Petit's observations on the formation of thrombi in severed vessels, Hunter's account of the reparative process, Benjamin Bell's classification of ulcers, the observations of Duhamel and others on the formation of callous and on bone-repair in general, Pott's distinction between spinal curvature from caries or abscess of the vertebræ and kyphosis from other causes, observations by various surgeons on chronic disease of the hip, knee, and other joints, and Cheselden's description of neuroma. Among the great improvements in surgical procedure we have Cheselden's operation of lithotomy (six deaths in eighty cases), Hawkin's cutting gorget for the same (1753), Hunter's operation (1785) for popliteal aneurism by tying the femoral artery in the canal of the triceps where its walls were sound ("excited the greatest wonder," Assalini), Petit's, Desault's, and Pott's treatment of fractures, Gimbernat's (Barcelona) operation for strangulated femoral hernia, Pott's bistoury for fistula, White's (Manchester) and Park's (Liverpool) excision of joints, Petit's invention of the screw-tourniquet, the same surgeon's operation for lacrymal fistula, Chopart's partial amputation of the foot, Desault's bandage for fractured clavicle, Bromfield's artery-hook, and Cheselden's operation of iridectomy. Other surgeons of great versatility and general merit were Sharp of London, Gooch of Norwich, Hey of Leeds, David and Le Cat of Rouen, Sabatier, La Faye, Ledran, Louis, Morand, and Percy of Paris, Bertrandi of Turin, Troja of Naples, Palleta of Milan, Schmucker of the Prussian army, August Richter of Göttingen, Siebold of Würzburg, Olof Acrel of Stockholm, and Callisen of Copenhagen.

Two things have given surgical knowledge and skill in the nineteenth century a character of scientific or positive cumulativeness and a wide diffusion through all ranks of the profession. The one is the founding of museums of anatomy and surgical pathology by the Hunters, Dupuytren, Cloquet, Blumenbach, Barclay, and a great number of more modern anatomists and surgeons; the other is the method of clinical teaching, exemplified in its highest form of constant reference to principles by Lawrence and Syme. In surgical procedure the discovery of the anæsthetic properties of ether, chloroform, methylene, etc., has been of incalculable service; while the conservative principle in operations upon diseased or injured parts and what may be called the hygienic idea (or, more narrowly, the antiseptic principle) in surgical dressings have been equally beneficial. The following are among the more important additions to the resources of the surgical art—the thin thread ligature for arteries, introduced by Jones of Jersey (1805); the revival of torsion of arteries by Amussat (1829); the practice of drainage by Chassaignac (1859); aspiration by Pelletan and recent improvers; the plaster-of-Paris bandage or other immovable application for simple fractures, club-foot, etc. (an old Eastern practice recommended in Europe about 1814 by the English consul at Bassorah); the re-breaking of badly-set fractures: galvano-caustics and écraseurs; the general introduction of resection of joints (Fergusson, Syme, and others); tenotomy by Delpech and Stromeyer (1831); operation for squint by Dieffenbach (1842); successful ligature of the external iliac for aneurism of the femoral by Abernethy (1806); ligature of the subclavian in the third portion by Astley Cooper (1806); and in its first portion by Colles; crushing of stone in the bladder by Gruithuisen of Munich (1819) and Civiale of Paris (1826); cure of ovarian dropsy by removing the cyst (since greatly perfected); discovery of the ophthalmoscope, and many improvements in ophthalmic surgery by Von Gräfe and others; application of the laryngoscope in operations on the larynx by Czermak (1860) and others; together with additions to the resources of aural surgery and dentistry. The great names in the surgery of the first half of the century besides those mentioned are:—Scarpa of Italy (1747–1832); Boyer (1757–1833); Larrey (1766–1842)—to whom Napoleon left a legacy of a hundred thousand francs, with the eulogy: C'est l'homme le plus vertueux que j'aie connu,"—Roux (1780–1854); Lisfranc (1790–1847); Velpeau (1795–1868); Malgaigne (1806–1865); Nélaton (1807–1873)—all of the French school; of the British school, John Bell, Charles Bell, Allan Burns, Liston, Wardrop, Astley Cooper, Cline, Travers, Brodie, Stanley, and Guthrie; in the United States, Mott, Gross, McGuire, Simms, and others; in Germany, Kern and Schuh of Vienna, Von Walther and Textor of Würzburg, Chelius, Hesselbach, and the two Langenbecks. In surgical pathology the discoveries and doctrines of the nineteenth century are greater in scientific value than those of any antecedent period; and it would be unprofitable to attempt any enumeration of them, or of their authors, in a brief space.

Practice of Surgery.—A great change has taken place in the practice of surgery in modern times. This change is due in great part to the fact that the germ theory of disease has been accepted by the majority of surgical teachers and practitioners. Scientific men have demonstrated that the causation of many diseased conditions is closely connected with the presence in the diseased organ, tissue, or individual of living organisms, which have to a certain extent been classified, and are supposed to be forms of plant life.

It is impossible to go with any fullness into the details of the experimental research by which the truth of the germ theory was proved; but some allusion must be made to the salient points which have a bearing on the work of the surgeon. It has long been known that subcutaneous injuries follow, as a rule, a very different course from open wounds; and the past history of surgery gives evidence that surgeons not only were aware of this great difference but endeavored, by the use of various dressings, empirically to prevent the evils which were matters of common observation during the healing of open wounds. Various means were also adopted to prevent the entrance of air, *e.g.*, in the opening of abscesses by the "valvular method" of Abernethy, and by the subcutaneous division of tendons in the common deformity termed "club-foot." Balsams, turpentine, and various forms of spirit were the basis of many varieties of dressing. These different dressings were frequently cumbersome, difficult of application, and did not attain the object aimed at, while at the same time they retained the discharges, and gave rise to other evils which prevented rapid and painless healing. In the beginning of the nineteenth century these complicated dressings began to lose favor, and practical surgeons went to the opposite extreme and applied a simple dressing, the main object of which was to allow a free escape of discharge. Others applied no dressing at all, laying the stump of a limb after amputation on a piece of dry lint, avoiding thereby any unnecessary movement of the parts. Others left the wound open for some hours after an operation, preventing in this way any accumulation, and brought its edges and surfaces together after all oozing of blood had ceased and after the effusion, the result of injury to the tissues by the instruments used in the operation, had to a great extent subsided. As a result of these various improvements many wounds healed in a thoroughly satisfactory manner. But in other cases inflammation often occurred, accompanied by pain and suppuration or the formation of pus, and various feverish conditions, due to and in some way connected with the unhealthy state of the wound, were observed. These constitutional sequelæ frequently proved fatal and the general impression of surgeons was either that the constitution of the patient rendered him liable to these conditions, or that some poison had entered into the wound, and, passing from it into the veins or lymphatic vessels that had been cut across, reached the general circulation, contaminating the blood and poisoning the patient. The close clinical association between suppuration (or the formation of pus) in wounds and many of those fatal cases encouraged the belief that the pus cells from the wound entered the circulation (whence the word "pyæmia"). It was also frequently observed that a septic condition of the wound was associated with the constitutional fever, and it was supposed that the septic matter passed into the blood (whence the term "septicæmia"). It was further observed that the crowding together of patients with open wounds increased the liability to these constitutional disasters, and every endeavor was made by surgeons to separate their patients and to improve the ventilation of the larger hospitals. In building hospitals the pavilion and other systems, with windows on both sides and cross ventilation in the wards, were adopted in order to give the patients as much fresh air as was attainable. Hospital buildings were spread over as large an area as possible; the blocks were restricted in height, and if practicable were never higher than two stories. The term "hospitalism" was coined by Sir J. Y. Simpson, who collected statistics comparing hospital and private practice, by which he endeavored to show that private patients were not so liable to those constitutional sequelæ.

This was very much the condition of affairs when Lister in 1860, from a study of the experimental researches of Pasteur into the causes of putrefaction, stated that the evils observed in open wounds were due to the admission into them of organisms which exist in the air, in water, on instruments, on sponges, and on the hands of the surgeon. These organisms, finding a suitable nidus for their growth and development in the discharges and surrounding tissues, germinate in them and alter their chemical constitution, forming various poisonous compounds, which if absorbed into the blood, give rise to pyæmia and septicæmia. Having accepted the germ theory of putrefaction, he applied himself to discover the best way of preventing these organisms from reaching the wound from the moment that it was made until it was healed. He had to deal with a plant and he desired to interfere with its growth. This was possible in one of two ways—either (1) by directly destroying or paralyzing the plant itself before it entered the wound or after it had entered, or (2) by an interference with the soil in which it grew, for example, by facilitating the removal of the discharges and preventing their accumulating in the wound cavity, and by doing everything to prevent depression of the wounded tissues, because healthy tissues are the best of all germicides. Several substances were then known possessing properties antagonistic to sepsis or putrefaction, and hence called "antiseptic." Acting on a suggestion of Lemaire's, Lister chose for his experiments carbolic acid, which he used at first in a crude and impure form. He had many practical difficulties to contend with—the impurity of the substance, its irritating properties, the difficulty of finding the exact strength in which to use it: on the one hand, he feared to use it too strong, lest it should irritate the tissues to which it was applied and thus prevent healing; on the other hand he feared to use it too weak, lest its true antiseptic qualities should be insufficient for the main object in view. It is unnecessary to dwell on the details of his tentative experiments. As dressings for wounds he used various chemical substances, which, being mixed with carbolic acid in certain proportions, were intended to give off a quantity of carbolic acid in the form of vapor, so that the wound might be constantly surrounded by an antiseptic vapor which would destroy any organisms approaching it and at the same time not interfere with its healing. At first, although he prevented pyæmia in a marked degree, he, to a certain extent, irritated his wounds and prevented rapid healing. He began his experiments in Glasgow and continued them after his removal to the chair of clinical surgery in Edinburgh. After many disappointments, he gradually perfected his method of performing operations and dressing wounds, which will be best understood by an illustration.

A patient is suffering, let us say, from a diseased condition of the foot necessitating amputation at the ankle joint. The part to be operated on is enveloped in a towel which has been soaked with a 5 per cent. solution of carbolic acid. The towel is applied two hours before the operation, with the object of destroying the (putrefactive) organisms present in the skin. The patient is placed on the operating table, and brought under the influence of chloroform; the limb is elevated to empty it of blood, and a tourniquet is applied round the limb below the knee. The instruments to be used during the operation have been previously purified by lying for half an hour in a flat porcelain dish containing carbolic acid (1 to 20). The sponges are lying in a similar carbolic lotion. Towels soaked in the same solution are laid over the table and blankets near the part operated upon. The hands of the operator, as well as those of his assistants, are thoroughly purified by washing them in the same lotion, free use being made of a nail brush for this purpose. The operation is performed under a cloud of carbolized watery vapor (1 in 30) from a steam-spray producer. The visible bleeding points are first ligatured; the tourniquet is removed; and then any vessels that have escaped notice are ligatured. The wound is stitched, a drainage-tube made of red rubber being introduced at one corner to prevent accumulation of discharge; a strip of protective (oiled silk coated with carbolized dextrin) is washed in carbolic lotion and applied over the wound. A double ply of carbolic gauze is soaked in the lotion and placed over the protective, overlapping it freely. A dressing consisting of eight layers of dry gauze is placed over all, covering the stump and passing up the leg for about six inches. Over that a piece of thin Mackintosh cloth is placed, and the whole arrangement is fixed with a gauze bandage. The Mackintosh cloth prevents the carbolic acid from escaping and at the same time causes the discharge from the wound to spread through the gauze. The wound itself is protected by the protective from the vapor given off by the carbolic gauze, while the surrounding parts, being constantly exposed to its activity, are protected from the intrusion of septic contamination; and these conditions are maintained until sound healing has taken place. Whenever the discharge reaches the edge of the Mackintosh the case requires to be dressed, and a new supply of gauze applied round the stump. The gauze that is used should be freshly made and kept in a tin box to prevent evaporation of the volatile carbolic acid. This precaution is most needful in warm weather. Whenever the wound is exposed the stump is enveloped in a vapor (1 in 30) of carbolic acid by means of the steam-spray producer. At first a syringe was used to keep the surface constantly wet with lotion, then a hand-spray, such as Richardson's ether-spray producer. More recently a steam-spray producer has been introduced into practice. These dressings are repeated at intervals until the wound is healed, the drainage-tube being gradually shortened and ultimately removed altogether.

In the case of an accidental wound to which the surgeon is called a short time after its occurrence, carbolic lotion (1 to 20) must be injected into the cavity of the wound to destroy any organisms which may have fallen into it. The dressings already described are then applied. In operating on a case in which putrefaction has occurred, every endeavor must be made to destroy the causes of putrefaction which are already present. The substance most frequently used for this purpose is chloride of zinc solution, 40 grains to 1 oz. of water. This powerful antiseptic was extensively used some years ago by Mr. De Morgan, Middlesex Hospital, London. When the wound has been thus purified from its septic condition, the after-treatment must follow strictly the plan already recommended for a recent wound to avoid secondary contamination at subsequent dressings.

Since about 1875 surgeons have been trying to improve and simplify Lister's method; chemists have been at pains to supply carbolic acid in a pure form and to discover new antiseptics, the great object being to get a non-irritating substance which shall at the same time be a powerful germicide. Iodoform, eucalyptus, salicylic acid, boracic acid, corrosive sublimate, have been and are being used, and the question as to their relative superiority is not yet settled. Carbolic acid has the disadvantage of irritating the tissues. This is partly counterbalanced by its anæsthetic properties. Absorption of the carbolic acid has occasionally taken place, giving rise to symptoms of poisoning. But this danger has been greatly lessened by the introduction of pure acid. Of the antiseptics named carbolic acid, eucalyptus, and iodoform in solution are volatile; the rest are non-volatile. At first Lister for some years irrigated a wound with carbolic lotion during the operation, and at the dressing when it was exposed. The introduction of the spray displaced the irrigation method. At the present time the irrigation method is again gaining favor. All these different procedures, however, as regards both the antiseptic used and the best method of its application in oily and watery solutions and in dressings, are entirely subsidiary to the great principle involved—namely, that putrefaction in a wound is an evil which can be prevented, and that, if it is prevented, local irritation, in so far as it is due to putrefaction, is obviated and septicæmia and pyæmia do not occur. Alongside of this great improvement the immense advantage of free drainage is now universally acknowledged. Surgeons now understand the dangers which lie on every side, and this knowledge causes them to take greater care in the purification and in securing the greater cleanliness of wounds, and some hold that much of the good result follows from these precautions apart from the principle of the system.

An attempt has been made to divide the ubiquitous organisms into two great divisions—the infective and the non-infective. The first class can grow in living tissue; the second cannot. The first form their products in living matter; the second can only grow in dead or lowly vitalized matter. The infective organism can migrate from the original point of entrance by the vascular and lymphatic streams to distant parts of the body, and may there form secondary foci of infection. As regards the non-infective the manufactory of the poison is principally restricted to the near neighborhood of the original point of entrance, generally a wound. It cannot migrate into the living tissues around if they remain healthy. Both kinds of organism form ptomaines (πτῶμα, a carcase), the products of the fermentation which result from the breaking up of the tissue or discharge in which the organisms grow. They may enter the blood-stream and poison the patient. Their entry into the blood must be differentiated from the entry of the organism itself into the stream. Clinically, the two conditions, although often met with in one individual, are in many cases distinctly separable. This physiological division of organisms into infective and non-infective is at present only tentative, and much work must be done before a strictly physiological classification can be attempted; at present the main line of inquiry must be principally morphological. Even in this direction a difficulty meets the observer, because organisms change their shape according to the media in which they are cultivated.

Within recent years the main advance in surgery has been from the scientific side, due to increased precision in physiological knowledge and a careful study of the relation of organisms to various diseased conditions. And with this progress operative skill, in many directions previously unthought of, has kept pace. Cranial operative surgery has advanced as the motor areas on the surface of the brain have been localized with greater precision. The experimental physiologist has done his part; the clinical observer is now doing his. In the thoracic cavity also diseased conditions are now relieved by surgical operations. The greatest advance of all, however, is in connection with the abdominal cavity. Under this head the work of the last thirty years requires special notice. The peritoneum was at one time considered a closed book to the operator; now all is changed, and abdominal surgery has become one of the most important branches of operative work. Joints in a state of inflammation are also now freely opened and tension is relieved. With the relief of tension the inflammatory process subsides and the joint recovers. The excision of diseased joints has also become part of the everyday work of the surgeon. Cancerous affections—using the term in a clinical sense—of the tongue, rectum, and larynx are now treated by excision of these organs. But it is still a question in what cases the operation prolongs life, and what cases are specially suited for operation. While greater latitude has been given to surgical interference with the different cavities of the body, operations upon the limbs have been restricted in consequence of the acceptance of Lister's views with regard to wound treatment. Many limbs upon which formerly amputation was performed, as, for example, in the case of compound fractures, are now saved. The term "conservative surgery," which formerly had reference to the excision of a diseased joint instead of amputation of the affected limb, has now a wider meaning, and covers not only the different excisions which have taken the place of amputation but also those cases in which a limb is saved by careful antiseptic management after severe injury. At one time, perhaps, in the early stages of antiseptic wound treatment, the brilliancy of the results obtained by these means, and the immunity which resulted from the prevention of blood-poisoning, encouraged surgeons to save a limb which, when the wound was healed, was not really useful. An upper limb saved, however inefficient, is better than any artificial substitute, and every endeavor in the direction of conservation should be made. Conservation in the case of a lower limb, on the other hand, may be carried too far. Unless the saved limb can support the weight of the body, it is far better to perform amputation, because a satisfactory artificial substitute can be found to take the place of the lower extremity. In performing amputation on a lower limb every endeavor should be made to obtain a stump which will bear, in part at any rate, the weight of the patient's body. Since the introduction of anæsthetics rapidity in performing an amputation is not essential. Flaps can be carefully made; time can be taken to shape them; and they can be so arranged that the resulting cicatrix will not be opposite the sawn extremity of the bone. In order to obtain such flaps the surgeon is justified in sacrificing to some extent the length of the limb, if by so doing he can leave a mobile and painless stump on which an artificial limb can be comfortably fitted. But this does not hold good to the same extent for an upper limb. The pressure on the extremity is not so great, and the longer the stump the more easily can an artificial substitute be fitted on. As a result also of Lister's teaching operative procedure for the cure of various deformities, such as knock-knee, rickets, and clubfoot, in which the bones affected are freely attacked, has done much to relieve unsightly deformity and increase the usefulness of the individual. In all operations absorbable catgut ligatures for the cut vessels have since about 1861 taken the place of silk, which had to come away by ulceration—a destructive process antagonistic to rapid healing. Greater care is taken to save blood by emptying the part to be operated on before beginning the operation. Greater care is also taken to tie all bleeding points, so as to prevent reactionary hemorrhage and the escape of blood between the surfaces of the wound, whereby healing is retarded. Free drainage by india-rubber and glass tubing, by absorbable tubes made of decalcified bone, by skeins of catgut acting by capillarity—all the outcome of an understanding of the local irritation and constitutional fever caused by tension—have done more than anything else to enable the surgeon to attain his triple object—painlessness, rapidity, and safety in the healing of a wound. Lastly, the clear understanding of the term "antiseptic" in its fullest meaning, the knowledge of the power which the unirritated and healthy tissues have as germicidal agents, and the introduction of various antiseptic or rather antitheric substances, some of which destroy, some of which paralyze, those lowly organisms whose power for evil in an unhealthy tissue or an injured part is so great, contribute toward the same great end. By these means operations are to a great extent relieved of their dangers, and by anæsthesia, which prevents pain and suffering, they are robbed of their terrors.

When a joint has been severely contused, separation of the cartilage from the bone occurs; effusion then takes place between the cartilage and the bone; the cartilage is cut off from its nutrient supply; and, unless the joint is kept at complete rest, unless the effusion is absorbed, the cartilage will sooner or later become necrosed. The necrosed cartilage will give way; the bone beneath will be exposed; and, if the irritation is kept up, effusion, at first serous but soon becoming purulent in consequence of the tension within the joint, will take place. Changes follow in the opposing cartilage, which has been itself bruised by the primary jar, and perhaps even separated from the bone beneath. It will in its turn necrose, and the bone will be exposed, suppuration taking place within the joint. The synovial membrane will become diseased, the ligaments softened, and the evil sequence of events already described will ensue. A joint affected in this way is easily recognized from one in which the synovial membrane is primarily affected by the absence of swelling and by the intense pain. In the early stages complete rest should be obtained by affixing a weight to the affected limb. This, by setting up between the opposed and injured cartilaginous surfaces a condition of negative pressure, will tend to check the disease. But if this plan of treatment does not soon cause a subsidence of the pain, actual cautery must at once be resorted to. Contusion in which the cancellated bone is injured at some distance from the cartilage is most commonly met with in young people, in whom the extremities of the bones are not fully developed. In them the epiphyseal cartilages are richly supplied with blood for the performance of their physiological function, the formation of bone, and a comparatively slight injury may cause inflammation to be set up in the bone immediately in contact with the epiphyseal cartilage. As in the synovial membrane when it is affected with pulpy degeneration, this disease may be occasionally non-tubercular in character; but in the majority of cases, more especially when the primary injury is very slight, the disease assumes the tubercular type and tubercle is deposited. In such cases the symptoms are often very insidious; the young patient complains of some slight uneasiness, or the first thing to be noticed is a limp in walking when a lower limb is affected. In the case of an upper limb the patient will avoid moving the affected joint. As there is no external swelling, the disease may be overlooked in its early stages; but, if it is suspected, and if the affected limb is kept at rest, the inflammation will subside and recovery ensue. On the other hand, if the patient is allowed to use the limb, even in an imperfect way, the tubercular area may extend and the articular cartilage become affected. The articular cartilage does not in that case receive its proper nourishment; it disintegrates, breaks down, and the disease attacks the joint. Into this last tubercular matter escapes and suppuration occurs, resulting sooner or later in disorganization of the joint.

In recent years a useful limb has often been saved by excision of the affected joint. In the early stages the disease may subside under appropriate local treatment, such as counter-irritation, rest, pressure, assisted by constitutional treatment, such as tonics, fresh air, and careful dieting. By these means an operation may be avoided, and in applying such treatment it must be remembered that, while the disease itself may subside, the joint as an organ may be irretrievably damaged; it may become anchylosed. If anchylosis occurs in a flexed position of the hip or knee joints, the limb will be useless for progression; and an operation will be necessary in order to straighten it. In the ankle joint, if anchylosis occurs with the foot in an extended position, the patient will not be able to put his heel to the ground, and an operation will be necessary to bring the foot at right angles to the leg. Do not interfere with an anchylosed joint in the lower limb if it is in good position. If the shoulder joint becomes anchylosed after disease, the sterno-clavicular and acromio-clavicular joints take up to a great extent the function of the anchylosed shoulder. In the elbow, in whatever position the joint becomes anchylosed, the arm loses much of its usefulness and excision of the joint is performed in order to get a movable elbow. In the wrist it may be necessary to operate for anchylosis; but as a rule, if the fingers are mobile, the anchylosed wrist does not interfere to any great extent with the usefulness of the hand.

SURINAM. See GUIANA, DUTCH.

SURPLICE, a linen or muslin vestment, worn by clerks of all degrees of orders in the discharge of their public religious offices. It is by some supposed to be derived from the longer and more flowing vestment, which in the Roman Catholic Church is still used in the mass, and is called the "alb," but in that church the surplice is worn not alone by priests, but by all who have been admitted even to the church tonsure. Its most ordinary use is for the service of the choir, and it is also employed by priests in the administration of the sacraments and in preaching. The use of the surplice was strongly objected to by the Calvinistic and Zwinglian Reformers on the Continent and by the Puritans in England, who regarded this vestment as a relic of popery and made it the subject of vehement denunciations.

SURRENDER is an English mode of alienation of real estate. It is defined by Lord Coke to be "the yielding up of an estate for life or years to him that hath an immediate estate in reversion or remainder." (Coke upon Littleton, 337b.) It is precisely the converse of release, which is a conveyance by the reversioner or remainderman to the tenant of the particular estate. A surrender is the usual means of effecting the alienation of copyholds.

SURREY, a metropolitan county of England, is bounded north by the Thames, which separates it from Berks and Middlesex, east by Kent, south by Sussex, and west by Hampshire. Owing to the fact that it includes a portion of London, it ranks fourth among the counties of England in point of population, but in point of size it is only the thirtieth, the total area being 485,129 acres, or 758 square miles.

There are considerable varieties of soil, ranging from plastic clay to calcareous earth and bare rocky heath. The plastic clay is well adapted for wheat, the most largely grown of the grain crops, while barley, oats, and peas grow well on the loamy soils in different parts of the county. A considerable proportion of the area under green crops is occupied by the market gardens on the alluvial soil along the banks of the Thames especially in the vicinity of London.

The more important manufactures are chiefly confined to London and its immediate neighborhood. There are paper-mills at Wandsworth, and along the valley of the Wandle there are snuff, drug, and copper-mills. Calico bleaching and printing are carried on to a small extent in the same valley, and there are also a few silk mills and tanneries. Ropes, snuff, and drugs are likewise manufactured along the banks of the Mole. Woolen goods and hosiery are made at Godalming, and gunpowder is largely manufactured at Chilworth.

Surrey contains fourteen hundreds; the borough of Southwark (population 221,946), which has no municipal government, but for certain purposes is connected with the city of London; and the municipal boroughs of Godalming (2,505), Guildford (10,858), Kingston-upon-Thames (20,648), and Reigate (18,662). A considerable portion (22,472 acres, with a population in 1881 of 980,522) is within the metropolitan district of London, in addition to which there are the following urban sanitary districts—Aldershot (20,155), Croydon (78,953), Dorking (6,328), East Moulsey (3,289), Epsom (6,916), Farnham (4,488), Ham Common (1,349), Hampton Wick (2,164), New Malden (2,538), Richmond (19,066), Surbiton (9,406), Teddington (6,599), and Wimbledon (15,950). The county has one court of quarter sessions, and is divided into twelve petty and special sessional divisions. The central criminal court has jurisdiction over certain parishes in this county. The borough of Guildford has a separate court of quarter sessions and commission of the peace; the boroughs of Reigate and Kingston-upon-Thames have commissions of the peace; the borough of Southwark is included in the petty sessional division of Newington; and the borough of Godalming, in which the mayor and ex-mayor are magistrates, forms part of the petty sessional division of Guildford, the county justices having concurrent jurisdiction. The county contains 152 civil parishes, with parts of two others. It is shared among the dioceses of Canterbury, Rochester, and Winchester. Until 1885 the county for parliamentary purposes was divided into East, Mid, and West Surrey; it is now rearranged in six divisions, viz., Kingston, Mid (Epsom), Northeast (Wimbledon), Northwest (Chertsey), Southeast (Reigate), and Southwest (Guildford). The portion of Surrey formerly included in the borough of Greenwich was in 1885 included in the borough of Deptford (Kent); the borough of Guildford was disfranchised; one member was given to Croydon; and instead of the two metropolitan boroughs of Lambeth and Southwark the following fifteen constituencies (each returning one member) were created:—Battersea and Clapham, constituting two divisions; Camberwell, embracing the divisions of North Camberwell, Dulwich, and Peckham; Lambeth, embracing the divisions of Brixton, Kennington, Lambeth North, and Norwood; Southwark, containing the divisions of Bermondsey, Rotherhithe, and Southwark West; Wandsworth; and Newington, with the divisions of Walworth and West Newington.

Since the beginning of the nineteenth century the population has increased nearly 600 per cent. From 268,233 in 1801 it had increased by 1821 to 399,417, by 1851 to 683,082, by 1871 to 1,091,635, and by 1881 to 1,436,899.

SURREY, HENRY HOWARD, EARL OF, one of the leaders in the poetic movement under Henry VIII. that heralded the great outburst of the Elizabethan period. Of his personal life outside of his poetry only the barest outline is known, and till comparatively of late even that outline was not free from confusion. Three different men—the grandfather of the poet, his father, and the poet himself—bore the title within a period of ten or eleven years, and at one time the poet was confounded with his grandfather, and supposed to have been present at the battle of Flodden (1513). He was not born till at least two years after that event. Although the poet has always been most familiarly known as the earl of Surrey, he really held the title only by courtesy, succeeding to it on that footing in 1524, when his father became duke of Norfolk. The tradition that he made the tour of Europe as a knight-errant, upholding against all comers the superiority of his mistress Geraldine, has no extrinsic evidence in its favor. The eminence of the Howards at Henry VIII.'s court was evidenced in many ways: in the festivities at the king's marriage with Anne of Cleves, Surrey was the leader of one of the sides at the tournament, and two years later his cousin, Catherine Howard, became the king's fifth wife. Surrey took an active part in the insignificant wars of Henry's later years, accompanied the expedition, led by his father, which ravaged the south of Scotland in 1542, and held a command in the French expedition of 1544. When the king's death was known to be near, the duke of Norfolk was suspected of aiming at the throne, and Surrey's own haughty and ostentatious manners countenanced the suspicion. A month before the king's death both were arrested and lodged in the Tower, and on January 13, 1547, Surrey was brought to trial for high treason. The main charge against him was that he had "falsely, maliciously, and treacherously set up and borne the arms of Edward the Confessor." His plea that the arms belonged to his ancestors was probably not accepted as an extenuation of the offense. A common jury found him guilty, and he was executed on Tower Hill on January 19th.

SURROGATE is a deputy of a bishop or an ecclesiastical judge, acting in the absence of his principal, and strictly bound by the authority of the latter. At present the chief duty of a surrogate is the granting of marriage licenses. Quite recently judgments of the arches court of Canterbury have been delivered by a surrogate. The office is unknown in Scotland, but is of some importance in the United States. In the State of New York the surrogate's court is a court of record, with jurisdiction over the administration of the personal estate of the deceased person and certain other matters. In New Jersey the surrogate is an official of the orphans' court, grants unopposed probates, etc. The office also exists in other States.

SURVEYING is the art of determining the relative positions of prominent points and other objects on the surface of the ground and making a graphical delineation of the included area. The general principles on which it is conducted are in all instances the same: certain measures are made on the ground and corresponding measures are protracted on paper, on a scale which is fixed at whatever fraction of the natural scale may be most appropriate in each instance. The method of operation varies with the magnitude and importance of the survey, which may embrace a vast empire or be restricted to a small plot of land. All surveys rest primarily on linear measures for direct determinations of distance; but these are usually largely supplemented by angular measures, to enable distances to be deduced by the principles of geometry which cannot be conveniently measured over the surface of the ground where it is hilly or broken. The nature of a survey depends on the proportion which the linear and the angular measures bear to each other; it may be purely linear or even purely angular, but is generally a combination of both methods.

Surveys of any great extent of country were formerly constructed on a basis of points whose positions were fixed astronomically, and in some countries this method of operation is still of necessity adopted. But points whose relative positions have been fixed by a triangulation of moderate accuracy present a more satisfactory and reliable basis; for astronomical observations are liable, not only to the well-known intrinsic errors which are caused by uncertainties in the catalogued places of the moon and stars, but to external errors arising from deflexions of the plumb line under the influence of local attractions, and these of themselves materially exceed the errors which would be generated in a fairly executed triangulation of a not excessive length, say not exceeding 500 miles. The French Jesuits who made a survey of China for the emperor about 1730 appear to have been the first deliberately to discard the astronomical and adopt the trigonometrical basis. In India the change was made in 1800, when what is known as the Great Trigonometrical Survey was initiated by Major Lambton—with the support of Colonel Wellesley, afterward Duke of Wellington—as a means of connecting the several surveys of routes and districts which had already been made in various parts of the country, and as a basis for future topography. This necessitated the inception of the survey as an undertaking calculated to satisfy the requirements of geodesy as well as geography, because the latitudes and longitudes of the points of the triangulation had to be determined for future reference—as in the case of the discarbed astronomical stations, though in a different manner—by processes of calculation combining the results of the triangulation with the elements of the earth's figure. The latter were not then known with much accuracy, for so far geodetic operations had been mainly carried on in Europe, and additional operations nearer the equator were much wanted; the survey was conducted with a view to supply this want. Thus a high order of accuracy was aimed at from the very first. In course of time the operations were extended over the entire length and breadth of Hindustan and beyond, to the farthest limits of British sway; they cover a larger area than any other national survey as yet completed, and are very elaborate and precise. Thus, as triangulation constitutes the most appropriate basis for survey operations generally, a short account will be given of the methods of the Great Trigonometrical Survey of India.

GREAT TRIGONOMETRICAL SURVEY OF INDIA.—*General Outlines.*—Primarily a network was thrown over the southern peninsula. The triangles on the central meridian were measured with extra care and checked by base-lines at distances of about 2° apart in latitude in order to form a geodetic arc, with the addition of astronomically determined latitudes at certain of the stations. The base lines were measured with chains and the principal angles with a three-foot theodolite, which, however, was badly damaged almost at the outset by an accident to the azimuthal circle. The signals were cairns of stones or poles. The chains were somewhat rude and their units of length had not been determined originally, and could not be afterward ascertained. The results were good of their kind, and sufficient for geographical purposes; but the central meridional arc—the "great arc"—was eventually deemed inadequate for geodetic requirements. A superior instrumental equipment was introduced, with an improved *modus operandi*, under the direction of Colonel Everest in 1832. The network system of triangulation was superseded by meridional and longitudinal chains taking the form of grid-irons, and resting on base-lines at the angles of the grid-irons. For convenience of reduction and nomenclature the triangulation west of meridian 92° E. has been divided into five sections—the lowest a trigon, the other four quadrilaterals distinguished by cardinal points which have reference to an observatory in Central India, the adopted origin of latitudes. In the northeast quadrilateral, which was first measured, the meridional chains are about one degree apart; this distance was latterly much increased, and eventually certain chains—as on the Malabar coast and on meridian 84° in the southeast quadrilateral—were dispensed with, because good secondary triangulation for topography had been accomplished before they could be commenced.

Modern Base-Lines.—All these were measured with the Colby apparatus of compensation bars and microscopes. The bars, ten feet long, were set up horizontally on tripod stands; the microscopes, six inches apart, were mounted in pairs revolving round a vertical axis and were set up on tribrachs fitted to the ends of the bars. Six bars and five central and two end pairs of microscopes—the latter with their vertical axes perforated for a look-down telescope—constituted a complete apparatus, measuring sixty-three feet between the ground pins or registers.

Plan of Triangulation.—This was broadly a system of internal meridional and longitudinal chains with an external border of oblique chains following the course of the frontier and the coast lines. The design of each chain was necessarily much influenced by the physical features of the country over which it was carried. The most difficult tracts were plains of great extent, devoid of any commanding points of view, in some parts covered with dense forest and jungle, malarious and deadly, and almost uninhabited, in other parts covered with towns and villages and umbrageous trees—the adjuncts and concomitants of a teeming population. In such tracts triangulation was impossible except by constructing lofty towers as stations of observation, raising them to a sufficient height to overtop at least the earth's curvature, and then either increasing the height to surmount all obstacles to mutual vision, or clearing the lines, both of which were laborious and expensive processes.

Selection of Sites for Stations.—This, a very simple matter in hills and open country, is often very difficult in plains and close country. In the early operations, when the great arc was being carried across the wide plains of the Gangetic valley, which are covered with villages and trees and other obstacles to distant vision, masts thirty-five feet high were carried about for the support of the small reconnoitring theodolites, with a sufficiency of poles and bamboos to form a scaffolding of the same height for the observer. Other masts seventy feet high, with arrangements for displaying blue lights by night at ninety feet, were erected at the spots where station sites were wanted. But the cost of transport was great; the rate of progress was slow; and the results were unsatisfactory. Eventually a method of touch rather than sight was adopted, feeling the ground to search for the obstacles to be avoided, rather than attempting to look over them; the "rays" were traced either by a minor triangulation, or by a traverse with theodolite and perambulator, or by a simple alignment of flags.

Instruments for Measuring Principal Angles.—Large theodolites were invariably employed. Repeating circles were highly thought of by French geodesists at the time when the operations in India were being commenced; but they were not used in the survey, and have now been generally discarded.

Signals.—Cairns of stones, poles, or other opaque signals were primarily employed, the angles being measured by day only; eventually it was found that the atmosphere was often more favorable for observing by night than by day, and that distant points were raised well into view by refraction by night which might be invisible or only seen with difficulty by day. Lamps were then introduced of the simple form of a cup, six inches in diameter, filled with cotton seeds steeped in oil and resin, to burn under an inverted earthen jar, thirty inches in diameter, with an aperture in the side toward the observer. Subsequently this contrivance gave place to the Argand lamp with parabolic reflector; the opaque day signals were discarded for heliotropes reflecting the sun's rays to the observer. The introduction of luminous signals not only rendered the night as well as the day available for the observations but changed the character of the operations, enabling work to be done during the dry and healthy season of the year, when the atmosphere is generally hazy and dust-laden, instead of being restricted as formerly to the rainy and unhealthy seasons, when distant opaque objects are best seen.

Measuring Horizontal Angles.—The theodolites were invariably set up under tents for protection against sun, wind, and rain, and centered, leveled, and adjusted for the runs of the microscopes. Then the signals were observed in regular rotation round the horizon, alternately from right to left and *vice versa;* after the prescribed minimum number of rounds, either two or three, had been thus measured, the telescope was turned through 180°, both in altitude and azimuth, changing the position of the face of the vertical circle relatively to the observer, and further rounds were measured; additional measures of single angles were taken if the prescribed observations were not sufficiently accordant. As the microscopes were invariably equidistant and their number was always odd, either three or five, the readings taken on the azimuthal circle during the telescope pointings to any object in the two positions of the vertical circle, "face right" and "face left," were made on twice as many equidistant graduations as the number of microscopes. The theodolite was then shifted bodily in azimuth, by being turned on the ring on the head of the stand, which brought new graduations under the microscopes at the telescope pointings; then further rounds were measured in the new positions, face right and face left.

Vertical Angles—Refraction.—The apparent altitude of a distant point is liable to considerable variations during the twenty-four hours, under the influence of changes in the density of the lower strata of the atmosphere. Terrestrial refraction is very capricious, more particularly when the rays of light graze the surface of the ground, passing through a medium which is liable to extremes of rarefaction and condensation, under the alternate influence of the sun's heat radiated from the surface of the ground and of chilled atmospheric vapor. When the back and forward verticals at a pair of stations are equally refracted, their difference gives an exact measure of the difference of height. But the atmospheric conditions are not always identical at the same moment everywhere on long rays which graze the surface of the ground, and the ray between two reciprocating stations is liable to be differently refracted at its extremities, each end being influenced in a greater degree by the conditions prevailing around it than by those at a distance; thus instances are on record of a station A being invisible from another B, while B was visible from A.

When the great arc entered the plains of the Gangetic valley, simultaneous reciprocal verticals were at first adopted with the hope of eliminating refraction; but it was soon found that they did not do so sufficiently to justify the expense of the additional instruments and observers. Afterward the back and forward verticals were observed as the stations were visited in succession, the back angles at as nearly as possible the same time of the day as the forward angles, and always during the so-called "time of minimum refraction," which ordinarily commences about an hour after apparent noon and lasts from two to three hours. The observations were always taken in pairs, face right and left, to eliminate index errors, only a few daily, but some on as many days as possible, for the variations from day to day were found to be greater than the diurnal variations during the hours of minimum refraction.

TRAVERSING, AS A BASIS FOR SURVEY.—*Rectan-*

gular Spherical Coördinates.—Traversing is a combination of linear and angular measures in equal proportions; the surveyor proceeds from point to point, measuring the lines between them and at each point the angle between the back and forward lines; he runs his lines as much as possible over level and open ground, avoiding obstacles by working round them. The system is well suited for laying down roads, boundary-lines, and circuitous features of the ground, and is very generally resorted to for filling in the interior details of surveys based on triangulation. It has been largely employed in certain districts of British India, which had to be surveyed in a manner to satisfy fiscal as well as topographical requirements; for, the village being the administrative unit of the district, the boundary of every village had to be laid down, and this necessitated the survey of an enormous number of circuits. Moreover, the traverse system was better adapted for the country than a network of triangulation, as the ground was generally very flat and covered with trees, villages, and other obstacles to distant vision, and was also devoid of hills and other commanding points of view. The principal triangulation had been carried across it, but by chains executed with great difficulty and expense, and therefore at wide intervals apart, with the intention that the intermediate spaces should be provided with points as a basis for the general topography in some other way. A system of traverses was obviously the best that could be adopted under the circumstances, as it not only gave all the village boundaries but was practically easier to execute than a network of minor triangulation.

Leveling.—Leveling is the art of determining the relative heights of points on the surface of the ground as referred to a hypothetical surface which cuts the direction of gravity everywhere at right angles. When a line of instrumental levels is commenced at the sea-level, a series of heights is determined corresponding to what would be found by perpendicular measurements upward from the surface of water communicating freely with the sea in underground channels; thus the line traced indicates a hypothetical prolongation of the surface of the sea inland, which is everywhere conformable to the earth's curvature.

The trigonometrical determination of the relative heights of points at known distances apart, by the measurements of their mutual vertical angles, is a method of leveling. But the method to which the term "leveling" is always applied is that of the direct determination of the differences of height from the readings of the lines at which graduated staves, held vertically over the points, are cut by the horizontal plane which passes through the eye of the observer. Each method has its own advantages. The former is less accurate, but best suited for the requirements of a general geographical survey, to obtain the heights of all the more prominent objects on the surface of the ground, whether accessible or not. The latter may be conducted with extreme precision, and is specially valuable for the determination of the relative levels, however minute, of easily accessible points, however numerous, which succeed each other at short intervals apart; thus it is very generally undertaken *pari passu* with geographical surveys, to furnish lines of level for ready reference as a check on the accuracy of the trigonometrical heights. In leveling with staves the measurements are always taken from the horizontal plane which passes through the eye of the observer; but the line of levels which it is the object of the operations to trace is a curved line, everywhere conforming to the normal curvature of the earth's surface, and deviating more and more from the plane of reference as the distance from the station of observation increases. Thus, either a correction for curvature must be applied to every staff reading, or the instrument must be set up at equal distances from the staves; the curvature correction, being the same for each staff, will then be eliminated from the difference of the readings, which will thus give the true difference of level of the points on which the staves are set up.

Leveling is an essentially simple operation; but, as it has to be repeated very frequently in executing a long line of levels—say seven times on an average in every mile—it must be conducted with every precaution against errors of various kinds, instrumental and personal, some accidental and tending to cancel each other, others systematic and cumulative. Instrumental errors arise when the visual axis of the telescope is not perpendicular to the axis of rotation, and when the focusing tube does not move truly parallel to the visual axis on a change of focus. The first error is eliminated, and the second avoided, by placing the instrument at equal distances from the staves; and, as this procedure has also the advantage of eliminating the corrections for both curvature and refraction, it should invariably be adopted. Errors of staff readings should be guarded against by having the staves graduated on both faces, but differently figured, so that the observer may not be biased to repeat an error of the first reading in the second.

Sea-Level.—The sea-level is the natural datum plane for leveling operations, more particularly in countries bordering on the ocean. The earliest surveys of coasts were made for the use of navigators, and, as it was considered very important that the charts should everywhere show the minimum depth of water which a vessel would meet with, low water of spring-tides was adopted as the datum. But this does not answer the requirements of a land survey, because the tidal range between extreme high and low water differs greatly at different points on coast-lines. Thus the generally adopted datum plane for land surveys is the mean-sea level, which if not absolutely uniform all the world over, is much more nearly so than low water.

The sea-level, however, may not coincide everywhere with the geometrical figure which most closely represents the earth's surface, but may be raised or lowered, here and there, under the influence of local and abnormal attraction, presenting an equipotential surface—an ellipsoid or spheroid of revolution slightly deformed by bumps and hollows—which Bruns calls a "geoid."

If any bumps and hollows exist, they cannot be measured instrumentally; for the instrumental levels will be affected by the local attractions precisely as is the sea-level, and will thus invariably show level surfaces even should there be deviations from the geometrical figure.

SURVEY OF INTERIOR DETAIL.—*General Principles.*—We have seen that the skeleton framework of a survey may be either a triangulation or a system of traverses; very generally it is a combination of both. The method of filling in the details is necessarily influenced to some extent by the nature of the framework, but it depends mainly on the magnitude of the scale and the requisite degree of minutiæ. In all instances the principal triangles and circuit traverses have to be broken down into smaller ones, to furnish a sufficient number of fixed points and lines for the subsequent operations. The filling in may be performed wholly by linear measurements or wholly by direction intersections, but is most frequently effected by both linear and angular measures, the former taken with chains and tapes and offset poles, the latter with small theodolites, sextants, optical squares, or other reflecting instruments, magnetized needles, prismatic compasses, and plane tables. When the scale of a survey is large, the linear and angular measures are usually recorded on the spot in a field-book and afterward plotted in office; when small they are sometimes drawn on the spot on a plane table and the field-book is dispensed with.

The Scale.—In every country the scale is generally expressed by the ratio of some fraction or multiple of the smallest to the largest national units of length, but sometimes by the fraction which indicates the ratio of the length of a line on the paper to that of the corresponding line on the ground. The latter form is obviously preferable, being international and independent of the various units of length adopted by different nations.

REPRESENTATION OF GROUND.—The master lines of ground are the main ridges and water-partings of the hills, the watercourses, and the horizontal contour lines of the coasts; the subordinate lines are those which define the undulations and minor features falling between the low-lying plains and the crests of the hills. These lines must first be laid down on a horizontal projection to fix the dimensions of each feature of the ground, after which the slopes must be indicated with sufficient relief and character to present a true picture of the corrugations of surface. In ancient maps the hills are represented as seen against the sky in profile by a spectator standing on the ground below at some distance off. About the end of the eighteenth century the prospective and the bird's-eye systems gave way to the true method of indicating the forms of hills, viz., by their horizontal projections, like all the other details of the ground, and by adding the requisite shading to bring every feature into proper relief.

Hill-Shading.—There are two rival methods of hill-shading—one by horizontal contours, the other by vertical hachures. A contour being the line of intersection of a hill by a horizontal plane, contour lines indicate the markings which would be made by the successive risings of a flood to different levels above the sea; vertical hachures indicate the directions which the particles of a volume of water, equally disseminated over the top of a hill, would naturally take in running down the sides and slopes. The most perfect representation of ground is obtained when the shade lines, whether horizontal or vertical, are sufficiently close and well graduated in tone and intensity to imitate good mezzotint shading in India ink.

Scale of Shade.—For military purposes it is very desirable that maps should be so drawn as to enable the angles of inclination of all slopes to be readily ascertained, with a view to determining what portions of the ground are suited for the maneuvers of each of the three arms—infantry, cavalry, and artillery. Thus military topographers of different nationalities have proposed a variety of scales to regulate the thickness and distance apart of the shade lines, and generally the proportion of black to white, for different angles of slope, that the map may convey to the mind as accurate a knowledge of the slopes of the ground as of the horizontal outlines. All slopes, however, are not of equal practical importance, but only those which are of most common occurrence and most liable to be gone over by men and horses and wheeled vehicles, and their inclination rarely exceeds 25°; consequently it is of most importance to be able to distinguish variations of slope below that angle; it is occasionally desirable to know the sharper slopes up to 45° or 50°, but greater inclinations are comparatively of rare occurrence and unimportant.

Of late years the system of shading by lines has been abandoned, and a method of representing slopes by mezzotint shading over a few governing contour lines, laid down by actual survey, has been introduced instead. The effect aimed at is a transparent shade, dark in proportion to the steepness of the ground represented; its object is to give body and expression to the contours and to explain and develop minor features of the ground which may lie between them. This style of shading, being distinct from all line drawing, may be applied over the most crowded details without causing confusion, such as would be produced by hachure shading. The contours are indicated by continuous red lines of constant thickness, strong enough to be everywhere visible through the shading.

Delineation by Instrumental Contouring.—A very precise knowledge of the configuration of surface may be acquired by carrying true contour lines over the ground and projecting them on the map of the survey. But the contours do not give a true representation of the ground, for they seldom represent actual lines on the surface, as do the lines on the map which indicate roads, watercourses, walls, inclosures, etc.; they give, however, a conventional representation which is sufficient *per se* for the engineer and the expert, and they furnish guiding lines for all shading, whether by hachures or mezzotint, which may be subsequently executed to produce an artistic delineation of the features of the ground. In instrumental contouring we have first to decide on the vertical intervals to be maintained between the contours. The intervals having been determined on, instrumental leveling is commenced at either the top or the bottom of those slopes which best define the general lay of the ground, or at some previously established bench mark of which the height above the sea is known. Points are marked out on the slopes with pickets at the prescribed vertical intervals, and then the contour lines of the horizontal planes passing in succession through each of these points are traced with a leveling instrument and staff and surveyed by traverse, the two processes being performed either simultaneously or consecutively as may be most convenient.

GEOGRAPHICAL RECONNAISSANCE.—When a traveler passes through an unknown or little known region the opportunity afforded him of acquiring some new geographical knowledge depends largely on the configuration and aspects of the ground, the condition of the atmosphere, the attitude of the inhabitants, and the time available. If hills are numerous and prominent and free from forest, and other conditions are favorable, a large area may be covered in a short time by reconnaissance from the stations of a chain of triangles carried along the line of route, fixing points in advance, some of which become stations of observation whence further points are fixed; and thus the continuity of the operations is maintained. But the ground may be flat and devoid of prominent points, the view circumscribed by forests and other obstacles, the atmosphere dense and unfavorable for distant vision, the inhabitants hostile, and the time short, and the traveler may be restricted to his line of route and unable to deviate from it; he must then endeavor to maintain a continuous traverse of the route, sketching in the ground in its immediate vicinity. Whenever breaks of continuity occur he must resort to astronomical observations to effect a connection between the dissociated sections of his survey and to obtain an independent check on the general accuracy of the operations. He has therefore to be prepared to measure base-lines, to carry on a triangulation in some regions and a traverse in others, and to make any astronomical observations which may be wanted, and, if possible, to complete his mapping on the ground instead of postponing it to be done elsewhere. He should supply himself with some instruments suited for rough and rapid work and with others for better work when time and opportunity permit, and he should be careful to arrange beforehand the general character of the proposed operations and the scales and projections to be adopted for the mapping; he should also provide himself with blank sheets of paper duly graticulated to scale, for work in detail in the vicinity of the line of route and for general geography.

For measures of base-lines and distances on the ground, chains, rolls of crinoline wire, long Assam canes, and perambulators may be employed, also omnimeters and subtense theodolites, to measure the angle subtended by a pole of known length, whence the distance may be deduced. For measures of angles and bearings, either theodolites, or sextants, or prismatic compasses may be used, according as more or less accuracy is required. For the general survey the plane table is a most valuable instrument: it enables bearings to be at once laid down on the paper without previous measurement, and much detail to be sketched in on the spot, instead of being plotted subsequently from a field-book; then the only independent angular measurements which need be taken are those of the principal triangles and of very distant points beyond the range of the table. Rough and rapid route surveys may be made by pacing the distances, taking the magnetic bearings, and combining with the results of astronomical observation. Many thousand miles of itinerary through regions in Central Asia have been surveyed by Asiatic employés of the Indian Government in this way; the northings and southings were controlled by latitude observations, and the factors thus obtained were applied to the eastings and westings, longitudes being impracticable. The theodolite should be employed to fix points on very distant ranges, for it will give good results, even with short bases and very acute angles, provided the objects actually observed are well identified in each instance. Observations should be taken from three stations, giving two triangles with a common side, which will at once show up any mistake, whether of identity, circle reading, or calculation. Whenever a break of continuity occurs in the triangulation or the traversing, astronomical observations must be resorted to. Much may be done by a judicious introduction of latitudes and azimuths, more particularly where there is considerable northing and southing, for then differences of longitude may be obtained from the azimuths and differences of latitude. A prominent peak, visible from great distances all round, may be made to serve as a connecting link between regions which cannot be continuously connected, by measuring its azimuth and distance from a base-line in each region; the addition of latitudes at the azimuth stations will much strengthen the work.

Collateral Astronomical Determinations.—Determinations of azimuth, latitude, time, and longitude may all be required for geographical reconnaissance—the first two more particularly, as they can be obtained readily with much accuracy; the fourth, being much the most troublesome to get and the least reliable when got, is only resorted to when it cannot be dispensed with.

The azimuth of an object may be determined without calculation by observing the angles between the object and a star at equal altitudes on opposite sides of the meridian; but it is generally found by observing the angle in one position of the star and applying thereto the azimuth of the star as obtained by calculation.

The latitude is most readily determined by measures of stars' zenith distances on the meridian, duly corrected for refraction; then, the polar distance being known, the latitude is at once ascertained. The stars should be observed in pairs of nearly equal zenith distance, north and south, for this eliminates all constant instrumental errors, as of index, eccentricity, and graduation, and also errors in the adopted refractions. When a single star is employed, circum-meridian observations of zenith distance may be taken and reduced to the meridian by calculation; tables for the pole star are given in the *Nautical Almanac*, which enable an observation, taken at any known time in the twenty-four hours, to be reduced to the pole.

The time is usually best determined by measuring the zenith distances of stars situated not far from the prime vertical; then, the latitude and polar distance being known, the hour angle of the spherical triangle is found by calculation. Time may also be determined by observing the transits of stars over the wires of the telescope of a theodolite set up in the meridian.

The longitude may be determined either absolutely, by purely astronomical methods, as by observations of the moon's motion, or differentially, with the aid of telegraph lines and traveling chronometers. Absolute longitude is the geographer's great difficulty; for much time must be devoted to the observations, and much more to their reduction, when undertaken with the object of fixing the relative positions of the stations of a survey.

Hypsometry.—Determinations of height form a very necessary part of geographical reconnaissance. Whenever triangulation is possible, vertical angles may be measured and the heights ascertained in regular succession. But in a traverse this is scarcely practicable; breaks of continuity in the verticals are liable to be of frequent occurrence, and then recourse must be had to observations of the pressure and temperature of the atmosphere, or of the temperature of the vapor of boiling water, from either of which fairly correct heights may be deduced differentially under normal atmospheric conditions in settled weather. The instruments employed for this purpose are mercurial and aneroid barometers and boiling-point thermometers; descriptions of them, and the formulæ employed in reducing the observations, are given under BAROMETER.

NAUTICAL SURVEYING.—Nautical surveying has for its object the determination of the configuration of land which is covered and concealed from view by water, more particularly along the foreshore of a coast-line, and wherever navigation is carried on in comparatively shallow waters, and a knowledge of the depth of water is of great importance; it has likewise to lay down the positions of oceanic islands, shoals, and rocks, and generally to delineate whatever land exists immediately above or below the surface of the ocean. Its methods differ according as they are performed in or out of sight of land. When in the vicinity of land it is preceded by a survey of the coast-line and a belt of the country beyond, which must be of sufficient breadth to furnish suitable points of reference for the survey operations on the water, and may have to be extended inland to embrace those peaks of distant hill ranges which are prominent objects at sea for the guidance of mariners. This done, the nautical survey is carried on in boats, by taking soundings and determining the positions of the boats by observations to some of the points already fixed on land. The observations are necessarily made with sextants and magnetic compasses only. With the former the angles between conspicuous land-marks are measured, and, as the angle between any two points is half the magnitude of the angle between the same points at the center of the circle which passes through them and through the boat, the measurement of two angles between three points enables two circles to be drawn on the chart, the intersection of which will generally indicate the position of the boat with sufficient accuracy. Occasionally, however, it happens that the positions of all three points on shore and the boat also lie actually, or very nearly, on the circumference of one and the same circle; then a bearing taken with the compass will fix the position of the boat on the circumference of the circle. Time is noted whenever soundings are taken, that due allowance may be made for the rise and fall of the tide. All the sounding stations are not fixed by observations to points on shore, as just indicated, but only a certain proportion, and between them straight lines of sounding are run, with intervals measured either by a patent log, or by time, or by counting the strokes of the oars; whenever possible the lines of sounding are carried parallel to each other. Sounding is the most important part of a nautical surveyor's duty and that on which his character mainly depends. It is essentially the work of the sailor, for in carrying it out the accidents of wind and water—the direction and force of the wind, the rise and fall of the tide, and the velocity of currents—must be duly taken cognizance of and the work managed to suit wind and weather; on the other hand, the work on land may be done by landsmen. Nautical surveying, out of sight of land, rests on astronomical determinations of latitude and time, chronometric longitudes, and dead reckoning by log. When triangulation is resorted to, base-lines are measured sometimes with a patent log, sometimes by sound, by noting the interval in time between the flash and the report of a gun. The great length of modern ironclads presents a base-line which is occasionally very convenient: points are taken at each end of the ship, as far apart as possible, from which two observers can see each other; they are carefully marked, and the distances between them determined for future reference; then angles between moderately distant objects and observers standing at these points, taken simultaneously from each point, enable the required distances to be obtained. The magnetic variation is determined by observing the azimuth of the sun, when on or near the horizon, with a standard compass fixed amidship, care being taken beforehand to determine any deviation of the needle which may be due to the attraction of the surrounding ironwork, by observing the bearing of a distant mark as the ship is swung round and her head laid on different points of the compass.

MAPPING.—*Graticulation.*—The sheets of paper on which the details of the survey of any large area of country are to be laid down must be furnished with a system of conventional lines, drawn with a view to assimilate the margins of contiguous sheets and to form a graticulation within which the details may be accurately inserted. The graticule is sometimes rectangular, sometimes spherical, sometimes a combination of both, as when points of which the latitude and longitude coördinates are given have to be plotted within rectangular marginal lines. Spherical graticules are constructed in various ways, usually in accordance with some specific method of projection.

When a map is constructed in rectangular sheets, some station is adopted as the origin and its meridian as the principal axis, to which the corner points of the sheets are to be referred; the coördinates of these points are given such dimensions as are most suitable for the size and scale of the map, and are equivalent to the rectangular sperical coördinates of imaginary points on the curved surface of the earth, at corresponding distances from the origin of its meridian. These being given, the distances of the points from the origin in latitude and longitude may be computed, as already shown; thus data become available for projecting the graticulation of meridians and parallels within the rectangular marginal lines of each sheet, or for introducing the divisions of latitude and longitude on the marginal lines if preferred. Filling in is then commenced: the principal stations are laid down by their coördinates and the topographical details penciled around them by copying or tracing the field-sheets of the survey; the names and the outlines are then inked in; the shading for delineating the features and general configuration of the ground is usually done last of all.

Photography is much employed as an auxiliary in mapping; for when a map is to be published on various scales the hand-drawn details of the largest scale edition may be reduced by its means as accurately as by the familiar pantagraph, and of course very much more rapidly. Thus town maps on the scale of $\frac{1}{500}$ are reduced to the scale of $\frac{1}{2500}$ for incorporation into the county maps; the latter are reduced for insertion in the six-inch maps, and they in turn for the one-inch map. By limiting the dimensions of each sheet for reduction, and by a judicious use of stops to lenses, the reductions are made without any error in scale or any distortion that can be detected by the most rigid examination.

INSTRUMENTS.—The instruments employed in survey operations are broadly divisible into two classes, one for making the requisite linear and angular measurements on the ground, the other for plotting the data thus acquired on paper, and for measuring from the map, when completed, lengths and areas which it may not be convenient to calculate from the numerical data. As a rule different instruments are employed for the mensuration on the ground and for the plotting on paper; but to this rule there is a notable exception in the plane table, by means of which all bearings may be drawn directly on paper with a sight rule, without previous measurement of any kind, and thus a plot of the ground may be constructed without employing any other instrument.

Field Instruments.—These are of two classes—linear, for determining distances directly by actual measurement along the surface of the ground, and angular, for determining the bearings of, or the angles between, any objects. Some instruments are automatic, as the needle, which points to the magnetic north, the plumb-line and the spirit-level, which indicate the direction of gravity, and hypsometers of various kinds, for measuring altitudes; others are entirely controlled by the manipulator. Some require to be rigidly supported on the ground, as measuring bars and theodolites; others are adapted for flexible supports, as reflecting and magnetic instruments, which may be employed either on land or on the oscillating deck of a ship at sea. Some, as magnetic compasses, measure angles in the horizontal plane only; others, as theodolites, in two planes—one horizontal, the other vertical; others, as reflecting instruments, in all planes; others, as leveling instruments, measure nothing, but simply indicate a plane of reference. And there are certain instruments by which angles are measured in the ordinary way, and direct distances are determined by micrometric measures of the small angles subtended at a distance by objects of known dimensions.

Linear instruments are of two classes—one for exact measurement of base-lines the lengths of which are required to be known with great precision, the other for ordinary and rough measurements. Among the former may be included the Colby apparatus of compensation bars and microscopes, described in Bessel's apparatus, those of Struve and the United States Coast Survey, and Porro's (adopted by the Spaniards and the French in Algiers). For less exact but still essentially accurate measures the instruments most commonly employed are the brass or steel chain of 100 links, the graduated metallic tape, and the offset pole.

For reconnaissance and rough measurement, perambulators, with wheels of known periphery and dials to indicate the number of revolutions, are largely used in

India. Crinoline wire has been employed with advantage in Australia; it is so light that a length of 1,000 feet or more may be easily carried, rolled on a drum, by one man, who pays it out as wanted; he is usually followed by another, who commences rolling it up at the opposite end when an entire length has been laid out on the ground. Air lines are sometimes measured by stretching the wire over the tops of trees in valleys obstructed with forest, also the breadths of rivers by resting the wire on logs anchored at suitable intervals to support it above water.

Angle-measuring instruments are of two classes, direct and reflecting. Both are provided with an aligner, usually a telescope, which is pivoted over the center of the graduated circle or sector: in one the aligner is pointed in succession to any two objects the angle between which is being measured; in the other it is pointed to one object, while an image of the second is thrown on the first by double reflection from a pair of mirrors. Reflecting instruments are largely employed in nautical surveys, as they can be held by the hand and do not require a rigid support; but they are very rarely used in land surveys. They give the angle in the plane in which they are held; and, whenever this plane is sensibly oblique to the horizon, the angle must be reduced by calculation to the plane of the horizon before it can be employed in the work of a land survey. The other instruments give the required horizontal angles, whatever the altitudes of the objects observed.

The circles of angle-measuring instruments are usually divided into 360 equal parts called degrees, and subdivided into spaces ranging downward from thirty to five minutes of arc, according as the diameter of the circle is increased. Smaller arcs are measured by interpolation between the subdivisions, with the aid of a circle reader which moves with the aligner. All instruments except those of the simplest form are supplied with one or more circle readers and spirit-levels and a telescope.

SUSA, the Biblical SHUSHAN, capital of Susiana or Elam and from the time of Darius I. the chief residence of the Achæmenian kings, was a very ancient city, which had been the center of the old monarchy of Elam and undergone many vicissitudes before it fell into the hands of the Persians (see ELAM). The site of the town, which has been fixed by the explorations of Loftus and Churchill, lies in the plain, but within sight of the mountains, between the courses of the Kerkha (Choaspes) and the Dizful, one of the affluents of the Pasitigris. The Shápúr, a small tributary of the Dizful, washes the eastern base of the ruin-mounds of Sús or Shúsh. Thus the whole district was fruitful and well watered, fit to support a great city; the surrounding rivers with their canals gave protection and a waterway to the Persian Gulf; while the position of the town between the Semitic and Iranian lands of the empire was convenient for administrative purposes. It is not therefore surprising that Susa became a vast and populous capital; Greek writers assign to it a circuit of fifteen or twenty miles, a statement sustained by the ruins.

SUSA, a city of Italy, in the province of Turin, thirty-three and a half miles west of Turin by the railway which passes by the Mont Cenis tunnel into France, is situated on the Dora Riparia (tributary of the Po) at 1,625 feet above the sea. The population of the city was 3,254 in 1871 and 3,305 in 1881 (commune, 4,418).

SUSA (*Súsa*), a city of Tunis, on the coast of the gulf of Hamáma, thirty-three miles south of Hamáma. The *Kasr al-Ribát*, a square building flanked by seven bastions, was probably either a Roman or Byzantine fortress, and a Byzantine chapel is now transformed into the *Kahwat al-Kubba* or Café of the Dome. Since the French annexation the citadel, built on the highest point within the town, has been entirely restored and serves as the headquarters of the general commanding a division; and a camp of tile-roofed brick buildings has been erected in the neighborhood. The space within the walls is proving too limited for the growth of the population, and houses already extend along the shore to north and south for about a mile. Susa is the ancient seaport of Kairwan (forty-five miles inland), with which it is connected by a horse-tramway, and it has a rapidly increasing commerce. In 1864 the port was visited by about 195 vessels, in 1885 by 701, of which 532 were Italian. The exports in 1885 were valued at $6,500,000 (oil, to Genoa and Leghorn $1,150,000; grain, largely to Sicily, $1,980,000; *sansa* or olive refuse, to France, $66,000; esparto, a comparatively recent article for this port, $86,000), and the imports (including building-stone from Sicily and Malta, brick, lime, marble, and timber) amounted to $3,300,000. Population upward of 15,000 in 1889.

SUSANNA ("Lily"), the heroine of one of the apocryphal additions to the Greek text of the book of Daniel, the others being the *Song of the Three Children* and the story of *Bel and the Dragon*. In the English version the story of the virtuous Susanna—the false accusation brought against her by the elders and her deliverance by the judgment of Daniel—is put as a separate book. Jerome, in his *Preface* to Daniel, points out that it had been observed both by Jews and Christians that this story was certainly written by a Greek, and not translated from Hebrew, since Daniel makes a series of Greek puns on the names of trees.

SUSQUEHANNA, a river which has its origin in Otsego and Canandaigua lakes in western New York, flowing eastward receives the rivers Unadilla and Chenango, then turning south enters Pennsylvania, where it receives the Pittson, the Tioga, the West Branch, and the Juniata, and empties itself into the Chesapeake Bay at Havre de Grace, Maryland, 400 miles from its source and 153 from its junction with the West Branch. It is a shallow, rapid mountain river, with varied and romantic scenery. A canal follows its course and great quantities of timber are floated down in the spring freshets.

SUSSEX, a maritime county in the south of England, lying between 50° 43′ and 51° 9′ N. latitude and 0° 49′ E. and 0° 58′ W. longitude. It is seventy-six miles from Lady Holt Park to Kent Ditch, and twenty-eight miles from Tunbridge Wells to Beachy Head, and adjoins Kent on the northeast, Surrey on the north, Hampshire on the west, and the English Channel on the south. Its total area is 933,269 acres, or 1,458 square miles.

The rivers are small and unimportant. The principal are the Rother, the Cuckmere, the Ouse, the Adur, the Arun, and the Lavant.

The portion of the county to the north of the South Downs is called the Weald; it formerly formed part of the forest of Andredsweald ("the wood or forest without habitations"), which was 120 miles in length and about 30 in breadth. The total area of forests in 1890 was the greatest of any county in England.

The county presents two distinct climates, that of the coast district being mild, equable, and dry, while that of the Wealden district is continental, extreme, and rainy. The coast rainfall is about twenty-five to twenty-six inches annually, and that of the Weald about thirty-three inches; this is due partly to the South Downs, which rise up in the path of the rain-clouds, and partly to the large extent of forest.

Sussex is divided into the six rapes of Hastings, Pevensey, Lewes, Bramber, Arundel, and Chichester. The only rapes which exist for practical purposes are that of Hastings, which has a separate coroner, and the last three, in which the liability to repair bridges falls as of common right upon the rape instead of the county division. The boroughs of Hastings, Rye, Brighton, and the city of Chichester have separate commissions of the peace and courts of quarter sessions. There are eighteen petty and special sessional divisions.

The coast district has been under cultivation from the time of the Romans and is very fertile, being specially suitable for market gardens and for growing fruit trees. The fig gardens of West Tarring are celebrated. Marshall, describing the Weald in 1788, says: "The townships of the Weald are in general very large, owing, as it would seem, to the fewness of sites fit for habitation. * * * A large portion of the vale lands remain in a state of commonage, particularly on the outskirts and toward the extremities of the district. * * * There is scarcely an acre of natural herbage or old grassland;" of the coast district he observes that there is strong circumstantial evidence that the lands were not only brought to their present form but cultivated before the laying out of townships. He also mentions that in the Isle of Selsey he observed some common field land, as well as about Chichester. The South Downs afford excellent pasture for sheep, Sussex being famed for a special breed of blackfaced sheep.

The earliest statement as to the population of Sussex is made by Bede, who describes the county as containing in the year 681 land of 7,000 families. In 1881 the total population was 490,505, of whom 232,331 were male and 258,174 female. The principal towns were Brighton (population, 107,546; 128,440 in parliamentary borough), Hastings (42,258; 47,738 in parliamentary borough), Chichester (8,114), Lewes (10,815), and Rye (4,667).

There are now no important industries; the chief is the brick, tile, and pottery, the main center of which is St. John's Common. The census of 1881 returned 1,485 brickmakers in the county. The London, Brighton, and South Coast Railway Company have extensive works at Brighton. There is a daily service of passenger steamers from Newhaven to Dieppe in France, and large quantities of fruit, vegetables, butter, and eggs are conveyed from France to London.

SUTHERLAND, a northern maritime county of Scotland, is bounded east by Caithness, southeast by Moray Firth, south and southwest by Ross and a part of Cromarty, and north and west by the Atlantic and the North Sea. The area is 1,297,846 acres, or nearly 2,028 square miles. Sutherland has a much greater proportion of its area occupied by water than any other large county in Scotland, the parish of Assynt being completely honeycombed with lochs and tarns.

Agriculture.—According to the agricultural returns of 1889 only 3,110 acres out of 1,347,033 were in cultivation, less than a fortieth part of the whole area. The best land is that adjoining Moray Firth, where agriculture is in a very advanced condition. Along the river valleys there are, however, many fertile patches. Out of the 33,110 acres under tillage in 1889 there were 10,343 under grain crops, 5,052 under green crops, 8,861 rotation grasses, 8,602 permanent pasture, and 252 fallow. The principal grain crop is oats, which occupied 8,392 acres, barley occupying 1,845, rye 63, peas 24, and wheat only 19. Potatoes occupied 2,014 acres, and turnips and swedes 2,981. Cattle, chiefly West Highland, shorthorn, and crossbred, numbered in 1889 12,806, of which 5,576 were cows and heifers in milk or in calf; horses, which include a large number of ponies, although Clydesdales are used on the large farms, numbered 2,665, of which 2,015 were used solely for purposes of agriculture; sheep, the rearing of which is the staple business of the county, the principal breed being Cheviots, numbered 211,825, of which 158,961 were two years old and above; and pigs, 1,037.

Industries.—Various textile manufactures at one time established in the county have been discontinued, the only important manufacture now remaining being that of whisky at Clyne and Brora. Herring fishing prosecuted from Helmsdale is an important industry, and the cod, ling, and other deep-sea fishings engage a large number of boats and men. There are valuable salmon fisheries in several of the rivers.

Administration and Population.—The county contains thirteen entire parishes and part of the parish of Reay, the remainder being in Caithness. The county returns one member to parliament, and one is returned for the Wick group of burghs. Dornoch, the only royal burgh, had but 497 inhabitants in 1881, while Golspie had 1,548 and Helmsdale 794. The population has not varied greatly in numbers since the beginning of the nineteenth century. In 1801 the numbers were 23,117, and in 1881 they were 23,370, a gradual decrease having taken place since 1851, when the numbers reached 25,793. In 1881 there were 11,219 males and 12,151 females. Sutherland is the most sparsely peopled county in Scotland, there being only 12 persons to the square mile, while the average for Scotland is 125. Sutherland forms a joint sheriffdom with Ross and Cromarty, and a sheriff-substitute resides at Dornoch. Small debt circuit courts are held at Helmsdale, Tongue, Melvich, and Scourie, and justice of peace courts at Dornoch, Golspie, Brora, and Helmsdale.

SUTLER is a vendor of provisions, allowed by the quartermaster-general to follow an army in the field, for the purpose of supplying soldiers with such luxuries as they can afford to purchase. Sutlers are under martial law, accompanying the baggage on a march, and are naturally watched and severely punished if found guilty of any irregularities toward either the soldiers or the inhabitants of the country.

SUTTEE, the name given by English writers to the rite of burning a widow on the funeral pyre of her husband as practiced among certain Hindu castes, and especially among the Rajputs. The word *sati* (as it should rather be written) properly denotes the wife who so sacrifices herself, not the rite itself, and means "a good woman," "a faithful wife." The sacrifice was not actually forced on a wife, but it was strongly recommended by public opinion as a means to her own happiness and that of her husband in the future state, and the alternative was a life of degraded and miserable widowhood. The practice is now prohibited.

SUTTON COLDFIELD, an ancient market town and municipal borough of Warwickshire, England, is situated on the London and North-Western railway, eight miles south of Lichfield and seven northeast of Birmingham. The population of the township in 1871 was 5,936, and in 1881 it was 7,737.

SUTTON-IN-ASHFIELD, a town of Nottinghamshire, England, is situated on an eminence on the Nottingham and Worksop and the Erewash Valley railways, three miles west-southwest of Mansfield. The population of the urban sanitary district (area, 4,855 acres) in 1871 was 7,574, and in 1881 it was 8,523.

SUWALKI, a government of Russian Poland, occupies the northeast corner of the kingdom, extending to the north between East Prussia and the Russian governments of Kovno, Vilna, and Grodno. Its area is 4,846 square miles. Agriculture is the chief occupation, and potatoes are extensively grown for export to Prussia.

where they are used for the manufacture of spirits, which are smuggled into the province. The manufactures are unimportant (600 workmen; annual produce valued at $620,000, one-half being due to distilleries). All manufactured wares are imported, mostly from Prussia; and all trade is in the hands of Jews. The educational institutions include two gymnasia for boys, one for girls, one seminary for teachers (at Weiwery), one Catholic seminary, and 196 lower grade schools. The population was 606,573 in 1890.

SUWALKI, capital of the above government, is situated at the source of the Hancza, tributary of the Niemen, seventy-five miles northwest of Grodno. Its population was 18,640 in 1882.

SUWAROFF, or SUVOROFF, ALEXANDER VASILIEVICH, Russian general, was born at Moscow on November 24, 1729, the descendant of a Swede named Suvor who emigrated to Russia in 1622. Suwaroff entered the army at an early age and first distinguished himself at the battle of Kunersdorf in 1759, where he acted as aid-de-camp to General Fermor. Throughout the Seven Years' War he was conspicuous for his bravery and military skill. He next took part in the battles between the Russians and Poles at the period of the first dismemberment of Poland. Being afterward transferred to the banks of the Danube (1773), he there in the campaigns against the Turks laid the foundation of his reputation as a military commander. In 1775 he put an end to the formidable revolt of Pugatcheff, who was brought in chains to Moscow and there decapitated. In 1789 Suwaroff, defeated the Turks at Fokshani (Moldavia), and again in the same year on the Rimnik. In 1790 he took by assault the town of Ismail, on which occasion he sent his well-known couplet to the empress. On the termination of this war Suwaroff was summoned to another campaign against the Poles. After the defeat of Kosciusko by Fersen at Maciеowice in Siedlce (1794) he marched on Warsaw, and captured its suburb Praga, where 15,000 Poles were massacred. Upon this the city capitulated, and the Russian general was made field-marshal. He remained in Poland till 1795 and was received in triumph on his return to St. Petersburg. In November, 1796, the empress Catherine, his firm friend and admirer, died. On the accession of Paul, Suwaroff fell into disgrace and was banished to his country-seat at Kontchanskoe in the government of Novgorod. But in February, 1799, he was summoned by the emperor to assist in the campaign with the Austrians against the French. Suwaroff took command of the combined forces at Verona. He attacked Moreau, the French general, at Cassano, the ford of the Adda, and completely defeated him, taking about 3,000 prisoners; he then made a triumphal entry into Milan. He next defeated Macdonald on the Trebbia in a sanguinary engagement which lasted three days, from the 17th to the 19th of June (1799). Soon afterward Joubert was defeated and slain at Novi (August 15th). The emperor Paul, who soon after this time entirely changed his policy and made an alliance with Bonaparte, recalled Suwaroff in disgrace, and on his return refused to see him. The veteran retired to his country-seat, where he died on May 18, 1800.

SVEABORG, an important fortress of Finland, built by Count Ehrensvärd in 1749 on seven small islands off the harbor of HELSINGFORS, (*q.v.*) It is the seat of a great naval harbor and arsenal.

SWABIA, SUABIA, or SUEVIA (Germ. *Schwaben*), is the name of an ancient duchy in the southwest part of Germany, afterward transferred to one of the ten great circles into which the empire was divided in the reign of Maximilian I. (1493–1519). At present the official use of the name is confined to a province of Bavaria (capital, Augsburg), comprising a mere fragment of the former Swabia, but in common use it is still applied to the districts included in the old duchy. The duchy of Swabia was bounded on the north by the Rhenish Palatinate, on the east by the Lech (separating it from the duchy of Bavaria), on the south by Switzerland, the Lake of Constance, and Vorarlberg, and on the west by the Rhine. It corresponds roughly to the modern Würtemberg, Baden, and Hohenzollern, with part of Bavaria. The circle of Swabia coincided more nearly than most with the duchy from which it was named, but was rather more extensive. It was bounded by Switzerland, France (after the cession of Alsace), and the circles of the Upper and Lower Rhine, Franconia, Bavaria, and Austria. Its area was about 13,500 square miles.

SWAHILI (*Wa-Swahili*, *i.e.*, "Coast People," from the Arabic *sáhil*, coast), a term now commonly applied to the inhabitants of Zanzibar and of the opposite mainland between the parallels of 2° and 9° S., who are subjects of the sultan of Zanzibar, and whose mother-tongue is the Ki-Swahili language. According to present local usage no person would be called a Swahili unless he verified these two conditions. The Swahili are essentially a mixed people, in whom the Bantu and Arab elements are mingled in the proportion of about three to one; and the same is true of their speech, which of all the Bantu dialects has been most affected by Arab and other influences.

SWALLOW (A.-S. *Swalewe*, Icel. *Svala*, Dutch *Zwaluw*, Germ. *Schwalbe*), the bird which of all others is recognized as the harbinger of summer in the northern hemisphere; for, though some slight differences, varying according to the meridian, are constantly presented by the birds which have their home in Europe, in northern Asia, and in North America, respectively, it is difficult to allow to them a specific value; and consequently a zoölogist of wide views, while not overlooking this local variation, will regard the swallow of all these tracts as forming a single species, the *Hirundo rustica* of Linnæus. Returning, usually already paired, to its summer haunts, after its winter sojourn in southern lands, and generally reaching England about the first week in April, it at once repairs to its old quarters, nearly always around the abodes of men; and about a month later the site of the nest is chosen, resort being had in most cases to the very spot that has formerly served the same purpose—the old structure, if still remaining, being restored and refurnished. So trustful is the bird that it commonly establishes itself in any of men's works that will supply the necessary accommodation, and a shed, a barn or any building with an open roof, a chimney that affords a support for the nest, or even the room of an inhabited house—if chance should give free access thereto—to say nothing of extraordinary positions, may be the place of its choice. Wheresoever placed, the nest is formed of small lumps of moist earth, which, carried to the spot in the bird's bill, are duly arranged and modeled, with the aid of short straws or slender sticks, into the required shape. This is generally that of a half-saucer, but it varies according to the exigencies of the site. The materials dry quickly into a hard crust, which is lined with soft feathers and therein are laid from four to six white eggs, blotched and speckled with gray and orange-brown deepening into black. Two broods are usually reared in the season, and the young on leaving the nest soon make their way to some leafless bough, whence they try their powers of flight, at first accompanying their parents in short excursions on the wing, receiving from them the food themselves are as yet unable to capture, until able to shift for themselves. They collect in flocks, often of many hundreds, and finally leave the country about the end of August or early in September, to be followed after a few weeks by their progenitors.

Swallows are nearly cosmopolitan birds, inhabiting every considerable country except New Zealand, wherein only a stray example, presumably from Australia, occasionally occurs.

SWAMMERDAM, John, may be ranked almost with Leeuwenhoek as one of the most eminent Dutch naturalists of the seventeenth century. Born at Amsterdam in 1637, the son of an apothecary and naturalist, he was destined for the church; but he insisted on passing over to the profession of medicine, meanwhile passionately devoting himself to the study of insects. His *General History of Insects* and other kindred works lie at the foundation of modern entomology, and include many important discoveries. In 1675 he published his *History of the Ephemera*, and in the same year his father died. He became a hypochondriac and mystic, joined the followers of Antoinette Bourignon, and died at Amsterdam in 1680.

SWAN (A.-S. *Swan* and *Swon*, Icel. *Svanr*, Dutch *Zwaan*, Germ. *Schwan*), a large swimming-bird, well known from being kept in a half domesticated condition throughout many parts of Europe, whence it has been carried to other countries. In Europe, no definite limits can be assigned for its natural range, since birds more or less reclaimed and at liberty consort with those that are truly wild, and either induce them to settle in localities beyond its boundary, or of themselves occupy such localities, so that no difference is observable between them and their untamed brethren. From its breeding-grounds, whether they be in Turkestan, in southeastern Europe, or Scania, the Swan migrates southward toward winter, and at that season may be found in northwestern India (though rarely), in Egypt, and on the shores of the Mediterranean.

The Swan just spoken of is by some naturalists named the Mute or Tame Swan, to distinguish it from one to be presently mentioned, but it is the Swan simply of the English language and literature. Scientifically it is usually known as *Cygnus olor* or *C. mansuetus.* It needs little description: its large size, its spotless white plumage, its red bill, surmounted by a black knob (technically the "berry") larger in the male than in the female, its black legs and stately appearance on the water are familiar, either from figures innumerable or from direct observation, to almost every one. When left to itself its nest is a large mass of aquatic plants, often piled to the height of a couple of feet and possibly some six feet in diameter. In the midst of this is a hollow which contains the eggs, generally from five to nine in number, of a grayish-olive color. The period of incubation is between five and six weeks, and the young when hatched are clothed in sooty-gray down, which is succeeded by feathers of dark sooty-brown. This suit is gradually replaced by white, but the young birds are more than a twelvemonth old before they lose all trace of coloring and become wholly white.

Thus much having been said of the bird which is nowadays commonly called Swan, and of its allied form, we must turn to other species, and first to one that anciently must have been the exclusive bearer of the name. This is the Whooper, Whistling, or Wild Swan of modern usage, the *Cygnus musicus* or *C. ferus* of most authors, which was doubtless always a winter-visitant to this country, and, though nearly as bulky and quite as purely white in its adult plumage, is at once recognizable from the species which has been half domesticated by its wholly different but equally graceful carriage, and its bill—which is black at the tip, and lemon-yellow for a great part of its base. This entirely distinct species is a native of Iceland, eastern Lapland, and northern Russia, whence it wanders southward in autumn, and the musical tones it utters (contrasting with the silence that has caused its relative to be often called the Mute Swan) have been celebrated from the time of Homer to our own. Otherwise in a general way there is little difference between the habits of the two, and very closely allied to the Whooper is a much smaller species, with very well marked characteristics, known as Bewick's Swan, *C. Bewicki.* This was first indicated as a variety of the last by Pallas, but its specific validity is now fully established. Apart from size, it may be externally distinguished from the Whooper by the bill having only a small patch of yellow, which inclines to an orange rather than a lemon tint; while internally the difference of the vocal organs is well marked, and its cry, though melodious enough, is unlike. It has a more easterly home in the north than the Whooper, but in winter not infrequently occurs in Britain.

Both the species last mentioned have their representatives in North America, and in each case the trans-Atlantic bird is considerably larger than that of the Old World. The first is the Trumpeter Swan, *C. buccinator*, which has the bill wholly black, and the second the *C. columbianus* or *americanus*—greatly resembling Bewick's Swan, but with the colored patches on the bill of less extent and deepening almost into scarlet. South America produces two very distinct birds commonly regarded as Swans—the Black-necked Swan and that which is called *Cascaroba* or *Coscaroba.* This last, which inhabits the southern extremity of the continent to Chili and the Argentine territory, and visits the Falkland Islands, is the smallest species known—pure white in color except the tip of its primaries, but having a red bill and red feet.

A greater interest than attaches to the South American birds last mentioned is that which invests the Black Swan of Australia. Considered for so many centuries to be an impossibility, the knowledge of its existence seems to have impressed (more perhaps than anything else) the popular mind with the notion of the extreme divergence—not to say the contrariety—of the organic products of that country. By a singular stroke of fortune we are able to name the precise day on which this unexpected discovery was made. The Dutch navigator Willem de Vlaming, visiting the west coast of Zuidland (Southland), sent two of his boats on January 6, 1697, to explore an estuary he had found. There their crews saw at first two and then more Black Swans, of which they caught four, taking two of them alive to Batavia; and Valentyn, who several years later recounted this voyage, gives in his work a plate representing the ship, boats, and birds, at the mouth of what is now known from this circumstance as Swan River, the most important stream of the thriving colony of West Australia, which has adopted this very bird as its armorial symbol. Valentyn, however, was not the first to publish this interesting discovery. News of it soon reached Amsterdam, and the burgomaster of that city, Witsen by name, himself a fellow of the Royal Society, lost no time in communicating the chief facts ascertained, and among them the finding of the Black Swans, to Martin Lister, by whom they were laid before that society in October, 1698, and printed in its *Philosophical Transactions* (xx. p. 361). Subsequent voyagers, Cook and others, found that the range of the species extended over the greater part of Australia, in many districts of which it was abundant. It has since rapidly decreased in numbers, and will most likely soon cease to exist as a wild bird, but its singular and ornamental appearance will probably preserve it as a modified captive in most civilized countries, and perhaps even now there are more

Black Swans in a reclaimed condition in other lands than are at large in their mother-country. The species scarcely needs description; the sooty black of its general plumage is relieved by the snowy white of its flight-feathers and its coral-like bill banded with ivory.

SWANSEA, a municipal and parliamentary borough and large seaport of Glamorganshire, South Wales, is finely situated in an angle between lofty hills, on the river Tawe, near its mouth in the beautiful Swansea Bay, a recess of the Bristol Channel, and on the Great Western, London and North-Western, Midland, and Rhondda and Swansea Bay railway lines, forty-five miles west-northwest of Cardiff. The population of the parliamentary borough in 1881 was 73,971. Its area then was 4,777 acres, but in 1885, when Swansea received independent representation, the area was diminished, the population of this smaller area being 50,043 in 1881.

Swansea owes its prosperity to its situation in the neighborhood of extensive collieries and to its possession of great natural advantages as a harbor. With some exaggeration it has been called the "metallurgical center of the world," but the title must at least be allowed in reference to copper, which is imported to be smelted from all parts of the world. The smelting of copper, which has been carried on in the district from the time of Elizabeth, is the distinctive and most important industry of the town, the others including tinplate manufacture, lead smelting, spelter and zinc manufacture, the extraction and manufacture of silver, nickel, and cobalt, iron smelting, Siemens steel manufacture, the manufacture of chemicals, of agricultural manure, and of patent fuel, and the construction of railway carriages and wagons. In Swansea Bay there are valuable oyster fisheries.

SWARTZ, OLOF, a celebrated Swedish botanist, was born in 1760. He was the author of many systematic works, and largely extended our knowledge of both flowering plants and cryptogams. He died in 1818.

SWATOW (also, less frequently, SWARTOW and SHANTOW), a port of China, in the province of Kwangtung, opened to foreign trade in 1869. It is situated at the mouth of the main branch of the river Han, which thirty miles inland flows past the great city of Chow-chu or Tai-chu (Tie-chu), and the surrounding country is more populous and full of towns and villages than any other part of the province. English merchants settled on Double Island in the river as early as 1856; but the city, which is built on ground but recently recovered from the sea, was formerly a mere fishing village. The trade of the port has rapidly increased. The population of Swatow is upward of 30,000. In 1874 the foreign residents numbered 147 (63 British), including Double Island.

SWEAT. See NUTRITION.

SWEATING-SICKNESS. A remarkable form of disease, not known in England before, attracted attention at the very beginning of the reign of Henry VII. It was known indeed a few days after the landing of Henry at Milford Haven on August 7, 1485, as there is clear evidence of its being spoken of before the battle of Bosworth on August 22. Soon after the arrival of Henry in London on August 28 it broke out in the capital, and caused great mortality.

From 1485 nothing more was heard of it till 1507, when the second outbreak occurred, which was much less fatal than the first (it is said because the treatment was better understood) and attracted less notice. In 1517 was a third and much more severe epidemic. It began in London in July, and lasted till the middle of December.

In 1528 the disease recurred for the fourth time, and with great severity. It first showed itself in London at the end of May, and speedily spread over the whole of England though not into Scotland or Ireland.

The most remarkable fact about this epidemic is that for the first and last time it spread over the Continent. On July 25, 1528 (English style) or 1529 (Roman style), when it was beginning to decline in London, it suddenly appeared at Hamburg. The story went that the infection was brought by a ship returning from England, the sailors of which were suffering from the disease. However this may have been, the disease spread rapidly, so that in a few weeks more than a thousand persons died. In less than a week it had spread to Lübeck, and thus was the terrible sweating-sickness started on a destructive course, during which it caused fearful mortality throughout eastern Europe.

England was, however, destined to suffer from one more outbreak of the disease, which occurred in 1551, and with regard to this we have the great advantage of an account by an eye-witness, John Kaye or Caius, the eminent physician. It first appeared at Shrewsbury on April 13th, and, after spreading to other towns in Wales and in the midland counties, broke out in London, causing in one week the death of 761 persons. At the end of July it ceased in London, but it went through the east of England to the north, until the end of August, when it began to diminish. At the end of September it ceased altogether, without affecting Scotland or Ireland.

Symptoms.—The symptoms as described by Caius and others were as follows. The disease began very suddenly with a sense of apprehension, followed by cold shivers (sometimes very violent), giddiness, headache, and severe pains in the neck, shoulders, and limbs, with great prostration—in short, the usual symptoms of an acute febrile attack. In some cases the stomach was affected, and there was vomiting, but according to Caius this happened only in those who were full of food. The breathing was deep and frequent, the voice like a moan. After the cold stage, which might last from half an hour to three hours, followed the stage of heat and sweating. The characteristic sweat broke out suddenly, and, as it seemed to those unaccustomed to the disease, without any obvious cause. In some cases it was much more copious than in others, these differences depending, according to Caius, mainly on age, clothing, food, and other external circumstances, and also on the season, sweating being more profuse in hot weather. With the sweat, or after that was poured out, came a sense of heat, and with this headache and delirium, rapid pulse, and intense thirst. Palpitation and pain in the heart were frequent symptoms. No eruption of any kind on the skin was generally observed; Caius makes no allusion to such a symptom. In the later stages there was either general prostration and collapse, or an irresistible tendency to sleep, which was thought to be fatal if the patient were permitted to give way to it. The malady was remarkably rapid in its course, being sometimes fatal even in two or three hours, and some patients died in less than that time. More commonly it was protracted to a period of twelve to twenty-four hours, beyond which it rarely lasted. Those who survived for twenty-four hours were considered safe.

The disease, unlike the plague, was not especially fatal to the poor, but rather, as Caius affirms, attacked the richer sort and those who were free livers according to the custom of England in those days. "They which had this sweat sore with peril or death were either men of wealth, ease, or welfare, or of the poorer sort, such as were idle persons, good ale drinkers, and tavern haunters."

Relapses were not uncommon; but the statements sometimes made about the disease attacking the same person several times seem to rest on a misunderstanding of the original authorities. What is meant is that they had several, even twelve successive attacks of sweating. The disease was not thought to be transmitted by contagion from one person to another. Nevertheless, in its spread, it appears, like cholera, to have followed the main lines of human travel and traffic—passing with Richmond's army to Bosworth, thence to London, and so on. It would be difficult otherwise to explain why Calais should have been affected and not the adjacent parts of France. Even the very circumstantial story of the disease having been brought to Hamburg by a ship from England seems by no means incredible, though it is doubted by some.

SWEDEN comprises the eastern and southern divisions of the Scandinavian peninsula. Its northern extremity, Kuokimodka, is situated in 69° 3′ 21″ and the southern in 55° 20′ 18″ N. latitude. The western extremity (on the Cattegat) lies in 11° 6′ 29″ and the eastern (on the frontier of Finland) in 24° 10′ E. longitude. The greatest length of the country from north to south is 986 miles and its greatest breadth 286 miles, and the area is 170,713 square miles. The length of the coast-line is 1,603 miles, the length of the boundary line toward Norway 1,019 miles, and that of the boundary line toward Finland 305 miles.

Sweden is divided into three chief parts—the southern being called Götaland, the middle part Svealand or Sweden proper, and the northern Norrland. The north and northwest parts of Norrland are called Lapland.

Coast.—The coast of Sweden is not broken by so many or so deep fjords as that of Norway. The most considerable indentation is the above-mentioned Braviken Bay. On the other hand, the Swedish coast is, perhaps in a still greater degree than the Norwegian, fringed by innumerable little islets. Except on the coast round Skane, in the south, the mainland does not come into direct contact with the sea, girdled as it is by a belt of islands, holms, and skerries, more or less thickly set, which forms the so-called "skärgard" fence of skerries or outer coast. Between this wall of islets and the mainland, therefore, extends a connected series of sounds of the greatest importance for coastal navigation, since they admit of the employment of vessels of less size and strength. This skärgard forms, besides, a most valuable natural defense; for, while some sounds are deep, navigation in the vicinity of the coasts is, as a rule, practically impossible without the help of pilots.

In the Baltic lie the two great islands of Gotland and Öland, of which the former is itself a county and a bishopric. These islands are quite different from the Swedish mainland. They are formed of Silurian limestone. On the western coast of Gotland the limestone rocks descend precipitously into the sea, and the island forms a comparatively smooth plateau, which slopes gradually to the east. The limestone soil is very fertile, and trees and plants thrive on it that do not otherwise grow in the climate of Sweden, such as walnuts, ivy, etc. The case is the same in Öland. This island somewhat resembles a house-top. A sterile limestone plain (Alvaren) stretches the whole length of the island from north to south, and from this the country slopes both toward Calmar Sound on the west and toward the Baltic on the east. The slopes, especially the western, are very fertile.

Climate.—Sweden is situated between two countries of very different climatological conditions. On the west there is the maritime climate of the Norwegian coast, and on the east the continental climate of Russia. It may be said that Sweden alternates between the two. Cold winters alternate with mild ones, and warm and dry summers with cool and rainy ones. But different parts of Sweden have also in this respect a greatly differing climate, of which we readily see the reason if we only recollect the character and the general features of the configuration of the country. Lapland and the western part of the country along the Norwegian frontier have a pronounced continental climate, and so has the high plateau to the south of Lake Vetter. On the other hand, the climate is more maritime the more we approach the coasts of the Baltic, and on the coast of the Cattegat and in Skane the maritime climate distinctly predominates.

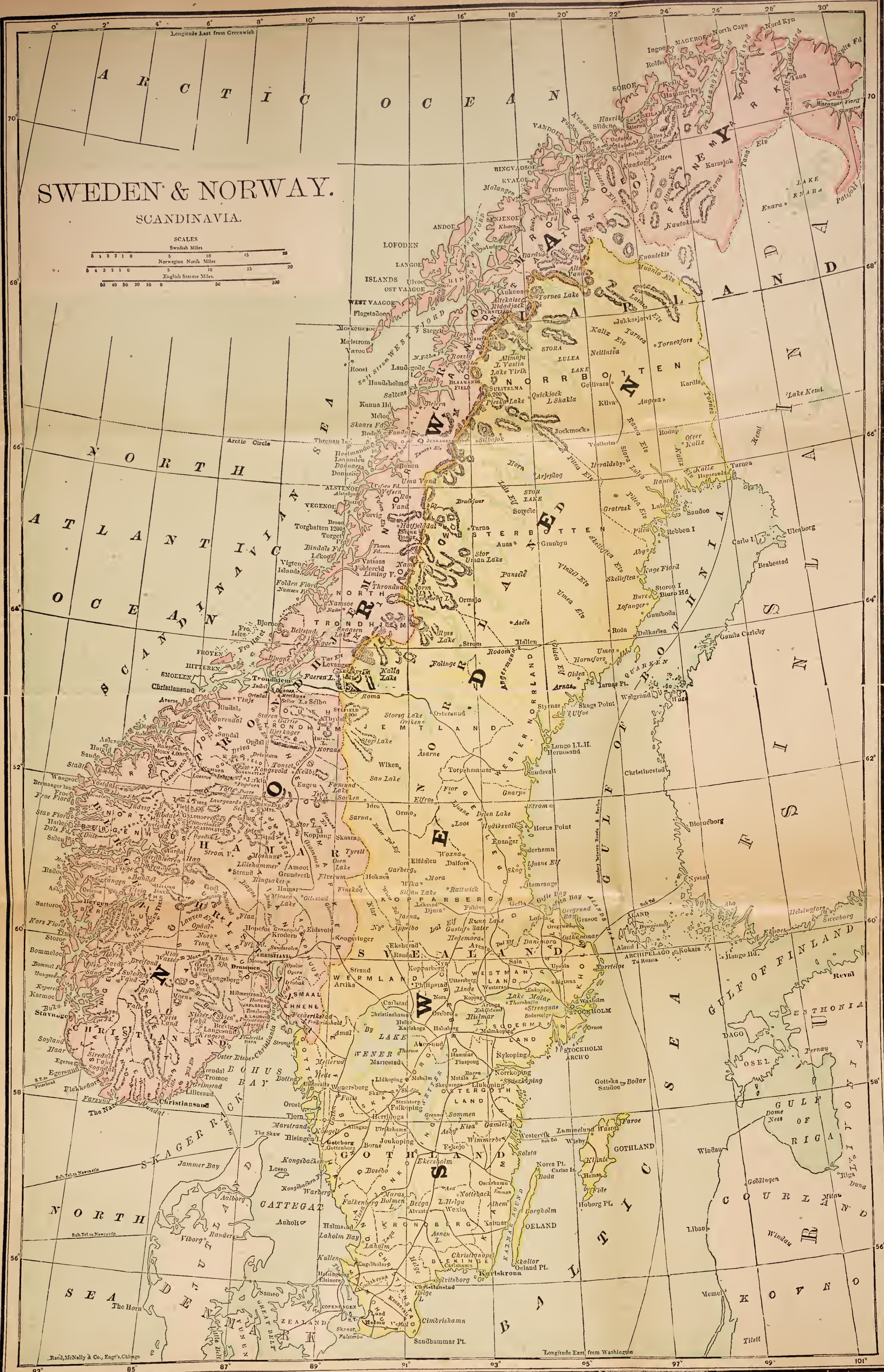
The mean direction of the winds shows little variation during different seasons. During the summer it is west or west-southwest in the south of Sweden, changes to southwest in the middle part of the country, and due south along the coast of the Gulf of Bothnia. In winter north-northeast winds become comparatively frequent in the north part of the country. This is explained by the difference in barometric pressure in summer and in winter. In July the mean height of the barometer indicates a gradual fall along the coast of the Baltic, from 29.828 inches in Calmar to 29.675 in Haparanda. In January, on the other hand, there is a gradual fall from 29.853 in Calmar to 29.718 in Hernösand, but thereafter a gradual rise to 29.834 in Haparanda. Unfortunately the isobarometric lines for Sweden have not yet been calculated with due precision.

The rainfall is greatest on the coast of the Cattegat. The annual amount is greatest at Gothenburg, where it is 32.56 inches. At Halmstad it is 28.26, and at Venersborg, where Göta Elf issues from Lake Vener, it is 30.33. These are the rainiest stations of Sweden. Generally speaking, the amount of rain diminishes afterward as well toward north and northwest as toward southeast. The least rain falls on the one hand in northern Lapland, where the annual amount is only 15.52 inches, and on the other hand in the southeastern corner of Sweden, where (at Calmar) we have the lowest known rainfall for the whole country (12.75 inches). Between these two tracts there runs a belt of greater precipitation from Gothenburg toward the northeast to Upsala, where the annual amount is 23.28. Even along this belt the amount of rainfall diminishes toward the northeast, but at every point the amount is greater than to the northwest and southeast of it. The greatest amount of rain falls in July and August, and the least in February and March. Thus, for instance, there fall in Upsala during August 2.86 inches and during March 0.99 inches. As the temperature varies, so does the rainfall for different years.

Flora.—Of the whole area of Sweden about 132,000 square miles are covered with wild vegetation. This may be broadly divided into five different sorts, viz., the forest, bush, marsh, heath, and prairie vegetations, of which the first-mentioned covers by far the largest area, or upward of 40 per cent. of the whole surface of Sweden. In the northern part of the country the fir (*Pinus sylvestris*) and the pine (*Pinus Abies*) are the predominating trees; south of Dal Elf the oak (*Quercus pedunculata*), and in the southern and southwestern provinces the beech (*Fagus sylvatica*), are, together with the fir and pine, the forest-forming trees. Besides these, there are two species of birch (*Betula verrucosa* and *B. odorata*), which form considerable forests. The bush vegetation derives its character from various species of *Salix*, *Rubus*, and *Rosa*, from *Prunus spinosa* and several other species. The marsh vegetation is composed of some low bushes, of *Cyperaceæ*, *Gramineæ*, and a small number of dicotyledonous and large-flowered

SWEDEN & NORWAY.

SCANDINAVIA.



monocotyledonous plants. The heath vegetation consists principally of social *Ericaceæ*, especially heather (*Calluna vulgaris*), and the prairie vegetation of a considerable variety of plants.

The Swedish phanerogamic flora is angiospermous, with about thrice as many dicotyledonous as monocotyledonous plants. The gymnosperms are only about 0.25 per cent. of the species of the flora. Its largest families are (in the order of number of species)—*Compositæ*, *Gramineæ*, *Cyperaceæ*, *Cruciferæ*, *Papilionaceæ* *Rosaceæ*, *Personatæ*, *Ranunculaceæ*, *Umbelliferæ*, *Alsinaceæ*, *Labiatæ*, and *Orchideæ*, the first-named being represented by 160, the last-named by 38 species. The number of families represented amounts to 99. The largest genus of the flora is *Carex*, with 88 species. More than 250 genera are represented by only one species each. The whole number of phanerogamic species now known in Sweden is 1,475.

Fauna.—After the close of the Glacial period a twofold immigration of animals occurred—from the southwest through Denmark, and from the northeast through Finland. Of the existing fauna, many species are widely spread. Especially in the north we find boreal circumpolar forms (wild reindeer, glutton, arctic fox, ptarmigan, several birds of prey, *Grallæ*, and aquatic birds). Others, such as the bear, the wolf, the fox, the magpie, etc., are to be found only in the Old World, but are represented in America by forms resembling them so much as to be regarded by many as only local varieties. Many of the commonest species, *e.g.*, the squirrel, the woodpeckers, the crow, most of the singing birds, etc., though wanting in the New World, are distributed over Europe and parts of northern Asia.

Besides these we find also specially eastern, southern, and western forms, which have immigrated from widely separated regions. Thus, the northern hare, *Lepus timidus*, properly an inhabitant of Russia and Siberia, but also to be found in the mountainous tracts of central Europe, is common in most parts of Sweden, while the European hare, *Lepus europæus*, which is spread over central and western Europe, and is also to be found in Denmark, is wanting. Most of the field-mice, and many birds which have an exclusively eastern range, have immigrated from Siberia. Among mammals, which nearly all belong to Europe, may be mentioned the roe-deer and the red-deer, the dormouse and the hédgehog; the last-named is common in central and southern Sweden. The elk is considered to have immigrated from the south.

The Swedish rivers and lakes are generally well stocked with fish. The objects of capture are chiefly salmon, eel, pike, different species of perch, burbot, and several species of the *Salmonidæ* and *Cyprinidæ*. The annual income from the fisheries in the lakes and rivers amounts to upward of $679,000, of which the salmon fisheries alone yield $210,000. Of still greater importance, of course, are the sea fisheries. In the end of last century the herring fishery in the "skärgard" of the west coast was the most important in Europe, and it is estimated that in one year 1,500 millions of herrings were taken. Somewhat later, however, the great shoals disappeared for a long time. In 1877 a new era began in the history of the west-coast fisheries, the take that year being 1,230,000 cubic feet. Since then the herring has returned every year in greater or smaller numbers. There are also captured on the same coast flat-fishes and cod-fish, mackerel, and sprats. The annual produce of the sea-fishery of the south and west coasts is valued at about $555,000. A smaller variety of the herring is found in great abundance on the east coast. In the Sound it is still eleven inches in length, in the Baltic only six or eight inches. This variety is called "strömming," and is the object of an important fishery, annually bringing in more than $875,000. About 140 kinds of fishes are constantly found in Sweden or along its coasts. Of these nearly 100 belong exclusively to the sea, and upward of 10 are to be found both in salt and fresh water. The remainder are properly fresh water fishes, but many are found in the brackish water of the Baltic coasts. Here we find perch, pike, etc., by the side of purely salt water fishes, as the "strömming," the flat-fish, etc.

Extent and Population.—Sweden takes rank among the larger countries of Europe. It contains 170,712.60 English square miles, of which area 3,517.29 square miles are occupied by the large lakes Vener, Vetter, Mälar, and Hjelmar, leaving 167,195.31 square miles, distributed among the counties as shown in the following table, which gives the areas and the estimated population of the different administrative divisions (the capital Stockholm and the twenty-four "län" or counties) into which the kingdom is divided:—

Lan.	Square Miles.	Population.
Stockholm (city)	12.65	215,688
Stockholm (rural)	3,008.45	148,841
Upsala	2,052.75	116,406
Sodermanland	2,630.64	150,032
Ostergotland	4,272.88	267,842
Jonkoping	4,440.51	197,392
Kronoberg	3,841.51	166,881
Calmar	4,439.06	240,507
Gotland	1,202.97	52,570
Blekinge	1,164.09	140,071
Christianstad	2,506.97	226,787
Malmohus	1,847.02	358,178
Halland	1,899.45	136,973
Goteborg (Gothenburg)	1,952.51	281,001
Elfsborg	4,948.15	282,335
Skaraborg	3,283.13	253,467
Vermland	7,345.73	259,958
Orebro	3,502.88	182,513
Vestmanland (Vesteras)	2,623.14	132,056
Kopparberg	11,420.8	194,291
Gefleborg	7,418.70	191,223
Vesternorrland	9,519.92	184,884
Jemtland	19,603.5	93,091
Vesterbotten	21,942.4	113,541
Norrbotten	40,315.5	96,241

The population has long been steadily increasing. In 1750 it amounted to 1,763,368, in 1800 to 2,347,303, and in 1850 to 3,482,541. The census of December 31, 1880, returned the number as 4,565,668 (2,215,243 males, 2,350,425 females).

It will be seen that Sweden is sparsely peopled (the average for the whole country being only 28 inhabitants to the square mile), and that the population is very unevenly distributed—Malmöhus län, which lies farthest south, counting 193 persons to the square mile, whereas Norrbotten, farthest to the north, and by far the largest county, has only 2.4.

The inhabitants of Sweden belong almost exclusively to the Scandinavian race. The principal exceptions are the Finns (in 1880 about 17,000), who chiefly inhabit the northeastern part of the county of Norrbotten, the Lapps (in 1880 about 6,400), spread over an area of about 44,000 square miles in Lapland and Jemtland, and the Jews (in 1880 about 3,000).

Agriculture.—Agriculture is the principal industry in Sweden. The number of persons gaining their livelihood by this occupation and those immediately depending on it was 2,342,000 in 1880, and the value of the harvest was estimated at about $127,500,000, of which the grain-harvest made $74,000,000. From 1840 to 1880 the export of grain (including meal, etc.) exceeded the import; but this has not been the case since

1881, while, on the other hand, the export of dairy produce has meanwhile increased.

Mines.—Sweden is rich in minerals, especially iron-ores, and the Swedish iron is celebrated for its good quality. Copper and silver also abound. Pit-coal has been found only in Malmöhus län, and even there in small quantity compared to the consumption of the country. The produce of the coal-mines is insufficient for domestic use, large quantities being imported.

Forests.—A great part of Sweden is, as was above mentioned, covered with forests. Most of these are the property of private persons or joint stock companies, but the government also possesses large forests. The forest produce ranks among the principal articles of export from Sweden.

Manufactures.—It was not till 1854 that Sweden completely broke with the pre-existing protectionist system, and adopted the principles of free trade. Since 1860 there has been no prohibition, and import duty is in general low. The value of the manufactures, which as late as 1850 was estimated at only $10,000,000, was for 1889 computed at more than $75,000,000.

Commerce.—The united value of the exports and imports of Sweden was estimated for 1850 at little more than $20,000,000, whereas in 1889 it was something over $200,000,000.

Railways, Posts, and Telegraphs.—The length of the railways in Sweden is very great in proportion to the population. In 1889 the total length was 4,862 miles. The post-office system is remarkably well organized. The telegraph system is also in a very flourishing condition.

Education.—With regard to education Sweden occupies a very prominent place. Primary education is compulsory for all the children of the country, and this principle is strictly applied. To supply this primary instruction there are 9,925 national schools of different kinds, with 5,216 male teachers and 6,832 female teachers. For higher educational purposes there are 96 public schools, of three grades, and two universities. In Stockholm there is, besides, a medical faculty, the Royal Caroline Medico-Chirurgical Institution. A free university is in course of formation, for which large sums have have been given by private persons. There are a large number of government schools for the military and naval services, for the technical sciences, for metallurgy, agriculture, nautical science, and for the blind and the deaf and dumb. All instruction at the national schools, the public schools, and the universities is free.

Religion.—Christianity was introduced into Sweden about the ninth century, and was generally professed by the twelfth. The country adopted the doctrines of the Reformation during the reign of Gustavus Vasa. The national church, established by the resolution passed at Upsala in 1593 (*Upsala möte*), is Lutheran. The country is divided into twelve bishoprics (*stift*). The bishop of Upsala is archbishop of Sweden. In 1880 the number of dissenters was 21,234, of whom 14,627 were Baptists, 2,993 Jews, 1,591 Methodists, and 810 Roman Catholics.

Army and Navy.—The land defenses consist partly of a standing army, partly of a militia. The former is for the most part founded on the so-called "indelningsverk," an institution dating from the time of Sweden's greatness, which makes the soldier a settled farmer. This force comprises about 40,000 men. The militia comprises (since 1885) all males between twenty-one and thirty-two years of age. The time of drill for the militia is only forty-two days, extending over two years.

The navy, with a permanent personnel (also for the most part founded on the "indelningsverk") of rather more than 7,000 men, consists principally of coasting vessels, both ironclad and unarmored.

Constitution.—Sweden is a limited monarchy. Its constitution, like that of England, rests on an historical development of several centuries.

The executive power is vested in the king alone. The legislative power he shares with the riksdag, both parties having the rights of initiative and veto. The king has, besides, a legislative power, not precisely defined, in certain economic matters. The right of levying taxes belongs to the riksdag alone; but the king may in certain cases (as, for example, through his right of lowering the custom duties) exercise a certain influence. He can declare war and make peace, and has the supreme command of the army.

The king is irresponsible, but all his resolutions must be taken in the presence of responsible councilors ("statsräd"). These, who form the council of state, are ten in number, of whom seven are also the heads of departments of the administration (justice, foreign affairs, army, navy, internal affairs, finance, and ecclesiastical affairs, including both church and schools.) For the advice they give, the councilors of state are responsible to the riksdag, which revises the record of their proceedings through an annually appointed board, which has power also to indict the councilors before a special tribunal, the "riksrätt," formed for the occasion, of which certain high functionaries have to be members. One of the councilors of state is, as prime minister, the head of the administration.

The riksdag meets every year on January 15th, and consists of two houses. The members of the first house, one for every 30,000 inhabitants (143 in 1887), are elected by the "landsting" in the counties, or by the municipal councils of the larger towns, for a period of nine years. They receive no payment. Any Swede is eligible who is at least thirty-five years of age, who possesses, and for three years before the election has possessed, real property to the value of 80,000 crowns, or who, during the same period, has paid taxes on an annual income of 4,000 crowns. The members of the second house (one or two for every district of judicature in the country, according as the population exceeds or falls short of 40,000, and one for every 10,000 inhabitants in the towns) receive a salary of 1,200 crowns, and are elected for a period of three years by electors, or directly, according to the resolution of the electoral district. If a member retires during that period, his successor is elected for the remainder of the three years, and thus the house is wholly renewed at regular intervals, which is not the case with the first house. The franchise is possessed by every one who owns landed property to the value of 1,000 crowns, or who has farmed for at least five years lands worth 6,000 crowns, or pays taxes on an annual income of 800 crowns. All electors are eligible. The number of electors is about 6.5 per cent. of the population. The towns elect their representatives separately. Both houses have in theory equal power. Before bills are discussed they are prepared by boards, whose members are elected by half of each house. When the houses differ on budget questions, the matter is settled by a common vote of both houses, which arrangement gives the second house a certain advantage from the greater number of its members. By revisers elected annually the riksdag controls the finances of the kingdom, and by an official ("justitieombudsman") elected in the same way the administration of justice is controlled; he can indict any functionary of the state who has abused his power. The bank of the kingdom is superintended by trustees elected by the riksdag, and in the same way the public debt is administered through an office ("Riksgäldskontoret"), the leader of which is appointed by the riksdag.

Administration, Law, and Justice.—The administration consists partly of a centralized civil service, arranged under different departments, partly of local authorities. Each of the twenty-four counties has a governor ("landshöfding") who presides over the local offices (the "landskansli," the "landskontor"), and is assisted by subordinate local officers ("kronofogdar," "häradsskrifvare," "länsmän"). There is, moreover, in each county a representation (the "landsting"), elected by the people, that deliberates on the affairs of the county and has a right to levy taxes. Each county is divided into parishes, which, like the towns, have a very strong communal self-government. The law of Sweden dates from 1736, but it has of course undergone a great many alterations and additions, the most important being the new penal law of 1864. Justice is administered by tribunals of three instances:—(1) the "häradsrätter" in the country, consisting of a judge and seven to twelve assessors elected by the people, who, if they are unanimously of an opinion different from that of the judge, can outvote him, and the "radhusrätter" (boards of magistrates) in the towns; (2) three "hofrätter" (higher courts) in Stockholm, Jönköping, and Christianstad; and (3) the royal supreme court, which passes sentence in the name of the king, and two members of which are present in the council of state when law questions are to be settled; this tribunal has, moreover, to give its opinion upon all proposed changes of the law. A jury is never summoned in Sweden except in cases affecting the liberty of the press.

Union with Norway.—Sweden has been united to Norway since 1814. The union is regulated by the "Riksakt" of 1815, according to which each country is free and independent, though both are governed by the same king. The connections of both countries with foreign states are regulated by the Swedish minister for foreign affairs, but when the king has to settle matters concerning foreign states which also are of importance to Norway a Norwegian councilor of state has to be present. Both countries have the same ambassadors and consuls abroad, and share the expenses of their support, Sweden bearing the larger part of this outlay. In war the two countries are bound to assist each other. Thus the union is what is called a "unio realis."

History.—From the earliest times of which we have any authentic information there were in Sweden two more or less distinct peoples—the Göta or Goths in the south, and the Svea or Swedes in the north. They spoke similar languages, were of the same Teutonic stock, and had like customs, institutions, and religious beliefs; but these facts did not prevent them from regarding one another with jealousy and dislike. The most powerful king among these peoples was the king at Upsala. There were other chiefs or kings, called in later times smaa-kongar, but they recognized the superiority of the Upsala king.

According to the *Ynglinga Saga*, in which bits of old Swedish legends are preserved, the first Upsala kings were Ynglingar, sprung from Yngve Frey, the grandson of Wodan. We are told that the last representative of this dynasty was Ingjald Illrede, that he slew six of the smaa-kongar, and that he afterward killed himself when he heard that the son of one of the murdered chiefs was advancing against him.

At this early period Sweden did not take in all the territory which now belongs to it. Scania, one of the most fruitful and prosperous districts of modern Sweden, had been from time immemorial an independent and comparatively powerful Gothic state. In the ninth century it was annexed to Denmark by King Guthrun; and, although in later times it was often a subject of bitter dispute between Denmark and Sweden, its connection with the former country was not finally severed until the seventeenth century. Lund, the principal town in Scania, was for many generations the see of the primate of the Danish church.

The scattered notices of Adam of Bremen, Saxo, and certain saints' lives, with a few allusions elsewhere, are our direct written sources for this early period. They may be eked out by study of the laws and of local nomenclature. Later the rich runic remains of Sweden give us some fuller help. After the end of the tenth century the evidence gradually becomes clearer and more trustworthy. There was then at Upsala a powerful king called Eric the Victory-Blest. He defeated a band of vikings in a great battle at Fyrisval, and, according to Adam of Bremen, had for some time complete control over Denmark. He was succeeded in 993 by his son Olaf (993–1024), who was called the Lap-King because he was a child when his reign began.

The Lap-King was succeeded, one after the other, by his sons Anund and Edmund the Elder. After Edmund the Elder's death the Goths resolved that Stenkil, the Christian jarl of West Gothland, should be made king. This decision was resisted by the Swedes, but the result of the civil war which broke out was that Stenkil was able to maintain his claim. He reigned from 1056 to 1066. His reign was followed by a period of much confusion, during which the Goths and the Swedes treated each other as enemies—the latter upholding paganism, the former contending for Christianity. Under Inge the Elder, who reigned from 1080 to 1112, the temple at Upsala was burned, and from this time there could be no doubt as to the ultimate triumph of the church, which was served with heroic courage by many zealous foreign missionaries. So much progress was made that Swerker Karlsson, who reigned from about 1135 to 1155, begged the pope to give the Swedish people bishops and a primate.

When Swerker was murdered in 1155 the Goths wished to make his son king, but the Swedes chose Eric Edwardsson, and he reigned until 1160.

For about a century after Eric's death the Goths and the Swedes were almost constantly at war with one another, each people choosing its own king. The Goths preferred the descendants of Swerker, while the Swedes were loyal to the descendants of Eric, who were known as the yeomen-kings, because Eric had originally belonged to the class of bondar or yeomen. The Danish kings often aided one or other of the contending parties, and as a rule they seem to have done far more harm than good by their interference. To some extent the church maintained among the people a sense of national unity, but it was not powerful enough to give much protection to the poorer members of the community against the despotism of local magnates. In the end, when the church itself became rich, the higher clergy were quite as tyrannical as the secular nobles.

John Swerkerson, the last king of the Swerker dynasty, died in 1222; Eric the Halt, the last of the yeomen-kings, in 1250. In the latter year the crown was given to Waldemar, whose mother was a sister of King Eric the Halt.

At the time of the death of Eric the Halt, Birger Brosa, Waldemar's father, was in Finland, where he conquered Tavastland and strengthened the hold of the Swedish crown over those tribes which had been already subdued. On his return to Sweden he was indignant to find that he had not himself been elected to the throne. He accepted what had been done, however, and devoted his energies to the promotion of his son's interests. After the death of Birger great evils were brought upon the country by the folly and incompetence of Waldemar, who was at last driven from the throne and imprisoned by his brother Magnus, who succeeded him.

Magnus was succeeded by his son Birger (1290–1319). Birger was only nine years old when his father died, and for a long time the power of the crown was wielded by his guardian, Torkel Knutsson, a wise and vigorous statesman. In 1306, misled by his brothers Eric and Waldemar, Birger caused this faithful and able counselor to be beheaded, and the result was civil war, in which the weak king found it hard to make way against his restless and ambitious brothers. At last he got them into his power by treachery, and threw them into a dungeon of the castle of Nyköping, where they died of starvation. Soon afterward Birger himself died, despised and hated by his subjects. He was succeeded by his nephew Magnus, his brother Eric's son, a child of about three years of age. Magnus' guardian, Mats Ketilmundsson, was a man of strong and noble character, and as long as his supremacy lasted the Swedish people were more prosperous than they had ever been before. In 1363 a number of nobles who had given Magnus much trouble, and whom he had expelled from the country, went to his sister's son Albert, count of Mecklenburg, and offered him the crown. The offer was accepted, and afterward Albert was formally elected by the Great Thing. Magnus resisted, but was defeated and made prisoner in a battle at Enköping in 1365. Albert of Mecklenburg proved to be utterly unfit for the task he had undertaken. In 1371 he accepted as his chief counselor a great Swedish noble called Bo Jonsson, to whom about a third of the kingdom is said to have belonged. After Bo Jonsson's death Albert attempted to regain some of the authority which he had been forced to delegate to his powerful minister; but the nobles refused to obey him, and invited Margaret of Denmark and Norway to take his place.

When the Swedish nobles asked her to undertake the government of Sweden, she at once expressed her willingness to attack Albert, who had irritated her by claiming the Danish crown. An army was soon dispatched to Sweden, and in 1389 Albert was defeated and taken prisoner at Falköping. In 1395 it was arranged that Albert should be set at liberty on condition that within three years he should pay a ransom of 60,000 marks.

Meanwhile Margaret had persuaded the Danes, the Norwegians, and the Swedes to accept her grandnephew Eric of Pomerania as her successor, and in 1397 he was crowned at Calmar. Margaret was eager that the union of the Scandinavian countries under a single sovereign should be made permanent, and delegates from the councils of state of the three kingdoms met at Calmar to discuss her proposals. On July 20, 1397, these delegates concluded what was called the union of Calmar. Sweden, Norway, and Denmark, while retaining their local laws and customs, were in all future time to be ruled by one king. When a king died he was to be succeeded by his eldest son; but if he were childless his successor was to be freely elected. In foreign affairs Scandinavia was always to act as a united country. Margaret had excellent intentions in devising this bold scheme, but the time was not ripe for so vast a change. It was inevitable that when popular movements were no longer held in check by her strong will, formidable difficulties should spring from the jealousies of the three nationalities.

Even after Eric's coronation Margaret remained the real sovereign, and she was powerful enough to make the union something more than a mere name. But even during her lifetime the Swedish people showed that they resented the idea of being taxed for objects in which they were only indirectly interested, and when she died (in 1412) it soon became evident that Eric would be unable to retain their allegiance, and in 1439 Eric was dethroned by all his kingdoms. He fled to the island of Gotland, where he lived for some years by piracy; and afterward he was compelled to seek for refuge in Pomerania.

Christopher of Bavaria, Eric's nephew, was elected to the Danish throne, and he was soon acknowledged also in Norway and Sweden. He was a man of good intentions, but was not strong enough to overcome the prejudice created against him by the fact of his being a foreigner. When he died in 1448 the Danes chose Christian, count of Oldenburg, as his successor, and the Norwegians by and by followed their example. But the Swedish people generally so strongly disliked the union, and stood so urgently in need of the protection of a native sovereign, that Charles Knutsson was made king. He mounted the throne as Charles VIII. The aristocracy, both spiritual and temporal, detested him; and in 1457 he found in Archbishop Jöns Bengtsson so formidable an enemy that he had to make his escape to Dantzic. Christian I. of Denmark and Norway then became king of Sweden, but he was unable to assert supremacy over the country as a whole, and in 1464 Charles VIII. again secured the throne. In the following year Charles was displaced a second time, but soon afterward he was recalled, and he retained the crown until his death in 1470.

Charles was succeeded, not as king but as regent, by his nephew Sten Sture, under whose firm rule Sweden became prosperous and contented. He died in 1503, when his authority passed to his nephew, Svante Nilsson Sture, whom King Hans and the Swedish clergy and nobles in vain attempted to put down. Svante Nilsson Sture was succeeded by his son, Sten Sture the younger, in 1512, and for some time this brave and patriotic regent vigorously held his own both against his enemies at home and against Christian II., king of Denmark and Norway. In 1520, however, he was mortally wounded in a battle with the Danes at Bogesund, after which Christian II. became king of Sweden. This sovereign had some enlightened ideas, but he was a man of ferocious passions, and he had no sooner restored the union than he made the maintenance of it impossible by an act of almost unparalleled cruelty. Under the pretense of upholding the honor of the church he ordered at Stockholm the execution of ninety persons accused of having taken part in the deposition of his friend and supporter Archbishop Gustavus Trolle, who had been the late regent's bitterest enemy. Most of the condemned men were nobles, and Christian hoped that by killing them he would secure the allegiance of the peasantry. The whole Swedish nation, however, was shocked by so horrible a massacre, and resolved to shake off forever the hated Danish yoke.

The movement for national independence was headed by Gustavus Ericsson, known afterward as Gustavus Vasa. This young noble had been one of a group of Swedish hostages whom Christian II. had sent to Denmark, treating them as if they had been prisoners of war. In 1519 he escaped from prison. In 1521 he had been declared regent, and in 1523, before the conquest of Stockholm and Calmar, he summoned at Strengnäs a diet which elected him to the throne.

Gustavus Vasa was by far the greatest sovereign who had up to this time ruled the Swedish people. So many changes were effected in Sweden in his time that several conspiracies were formed against him, but he had little difficulty in overcoming his enemies, for he had the confidence and affection of the great mass of his subjects. In 1544 it was decided by the diet that the Swedish throne should cease to be elective, and that it should be hereditary in the family of Gustavus.

When Gustavus died in 1560, his eldest son Eric became king. He wasted the treasure amassed by his father, and under the influence of passion and suspicion caused the death of many powerful and loyal subjects. In 1568 his brothers John and Charles rebelled against him. His favorite, Göran Persson, who was accused of having constantly misled him, was seized and executed, and Eric himself was obliged to surrender. He was deprived of the crown and kept in close confinement until 1577, when he was murdered.

John mounted the throne as John III. (1568–1592). He was succeeded by his son Sigismund, who had been elected king of Poland in 1587. In the interval between John's death and Sigismund's arrival in Sweden supreme power was exercised by Duke Charles, Sigismund's uncle.

Before his coronation in 1594 Sigismund undertook to protect the rights of his Protestant subjects; but, being an ardent Catholic, he soon began to work for the triumph of his own creed. On his return to Poland the discontent he had excited in Sweden found free expression, and he was obliged to place the administration of affairs in the hands of his uncle, Duke Charles. In 1600 the diet demanded that he should reside in Sweden or send his son to be educated as a Protestant. No answer being returned to these demands, Sigismund was dethroned, and his heirs were deprived of the right of succession. Duke Charles was then made king, and reigned as Charles IX.

Charles IX. was succeeded by his son, Gustavus Adolphus (1611–1632), the most illustrious of the kings of Sweden. He was only seventeen years of age when he became king, but he had already given evidence of high intellectual and moral qualities. One of his first public acts was to appoint as chancellor the youngest of his counselors, Axel Oxenstjerna, a great statesman whose name is intimately associated with all the most prominent events of his reign. By mingled gentleness and firmness Gustavus won almost immediately the goodwill of his subjects, and before he was many years on the throne he became the object of their most enthusiastic devotion. He showed unfailing respect for the rights of the diet, improved its organization, and summoned it regularly once a year. Industry and trade flourished under his wise rule, and he did much to develop the educational system of Sweden by giving splendid endowments to the university of Upsala and by founding the university of Dorpat and many schools and colleges. He introduced into the army a rigid system of discipline, yet he was adored by his soldiers, who had perfect faith in his military genius and were touched by his care for their welfare and by the cheerfulness with which, when necessary, he shared their hardships.

The war with Denmark which had been begun in his father's time he was obliged to continue, but he did so very unwillingly, and as soon as possible (in 1613) he signed a treaty of peace, by which, in return for the payment of 1,000,000 thalers, Sweden received back all the territory that had been conquered by the Danes. The next task of Gustavus was to subdue Sigismund of Poland, who had formally renewed his claim to the crown of Sweden after Charles IX.'s death, and had proved himself one of the most troublesome of the young Swedish king's enemies. In 1621 Gustavus took the field against him, and achieved a series of brilliant successes, which were interrupted only when, in 1629, Austria sent to the aid of Poland a force of 10,000 men under Arnheim.

Meanwhile the Thirty Years' War, begun in 1618, had been raging in Germany. Christian IV. of Denmark, who had intervened on behalf of the Protestants, had been forced to lay down his arms; and it seemed in the highest degree probable that the Catholic reaction, headed by the fanatical emperor Ferdinand II., was about to be completely triumphant. Gustavus, like his father and grandfather, was an enthusiastic Protestant, and he had watched with grief and dismay the misfortunes of those who were struggling for the right of free judgment in religion. At last he resolved to give them the support they so urgently needed.

He had many unexpected difficulties to contend with, for he was distrusted by most of the German Protestant princes. Very soon, however, his tact and courage enabled him to overcome every obstacle, and at Breitenfeld he gained a decisive victory over the imperial general Tilly. After this great success the confidence of the German Protestants revived, and Gustavus was everywhere received as their deliverer. Tilly tried to prevent him from crossing the Lech, but was again defeated; and the Swedish king took possession of Munich, having already held court at Frankfort. For some time the destinies of the empire appeared to be at his disposal, but all the hopes excited by his heroic career were suddenly cut short by his death in the battle of Lützen in 1632.

Gustavus was succeeded by his daughter Christina, whom, before his departure for Germany, he had presented to the diet as heiress to the crown.

The Swedish people were anxious that Christina should marry, but she declined to sacrifice her independence. In 1649, however, she persuaded the diet to accept as her successor the best of her suitors, her cousin Charles Gustavus of Pfalz-Zweibrücken, the son of the only sister of Gustavus Adolphus. She soon became wayward and restless, neglected her tried counselors, and followed the advice of self-seeking favorites. So much discontent was aroused by her extravagance and fickleness that she at last announced her determination to abdicate, and in 1654 she formally laid the royal insignia before the diet in order that they might be transferred to Charles Gustavus, who forthwith became king as Charles X.

Charles X. (1654–1660) devoted his energies chiefly to war, in which he was brilliantly successful. He began his military career by attacking Poland, whose king claimed to be the true heir to the Swedish crown. War with Denmark was several times renewed, and at the time of his death Charles was engaged in making extensive preparations for a fresh onslaught.

He was succeeded by his son Charles XI., a child of four years of age. During the minority of Charles XI. the government was carried on by his mother Hedwig Eleonore and by the chancellor De la Gardie and four other ministers. In 1672 Charles XI. himself assumed the direction of affairs. Charles became virtually an absolute sovereign, and on the whole he made an excellent use of his power. For more than a century Sweden had been almost constantly engaged in war. She now enjoyed a period of repose, and profited greatly by the king's vigorous administration. He built fortresses, reorganized the army and navy, and carried on many important public works in the interest of commerce. He also founded the university of Lund, and made larger provision for popular education, frequently impressing upon the clergy the duty of attending to the intellectual needs of their parishioners. His comparatively early death was lamented by the great majority of the people, who were grateful for the steady determination with which he applied himself to the duties of his office.

Charles XI. was succeeded by his son Charles XII. (1697–1718), the most brilliant although not the greatest figure in Swedish history. He was in reality a man of extraordinary vigor and daring, and he soon convinced his enemies that they would find in him a formidable opponent. In 1700 he began what is known as the Northern War by suddenly advancing against Copenhagen, which he was about to besiege when Frederick, alarmed by the overwhelming numbers of the enemy, accepted Charles' terms, and signed the peace of Travendahl. Charles at once crossed the Baltic to attack Augustus II. and Peter I., the former of whom was besieging Riga, while the latter threatened Narva. At Narva the Swedish king gained a splendid victory, and afterward he defeated the Saxons, driving them away from Riga. If he had now concluded a peace, he might have been for many years by far the greatest potentate in Northern Europe. But he was resolved to humiliate Augustus II., and this he did most effectually. Meanwhile Peter I. had been taking possession of Swedish territory on the Baltic, and on a portion of it had begun to build St. Petersburg. Instead of attacking him directly, Charles resolved to thwart him by seizing Moscow, and this decision proved fatal to his great designs. Worn out by a long and dreary march, during which many soldiers died of hunger and disease, his dispirited army was defeated at Poltava (1709); and Charles, ignorant of the real condition of the enemy's forces, fled across the Russian frontier into Turkey. He remained five years in the Turkish dominions, trying to induce the sultan to become his ally. Convinced at last that nothing was to be gained from Turkey, Charles made his escape, and in fourteen days rode from Adrianople to Stralsund. In his absence the war had been continued by Peter I., who had soon been joined again by Augustus II. and Frederick IV.; and ultimately the alliance was strengthened by the accession of the king of Prussia and the elector of Hanover, each of whom was eager to possess those Swedish territories which were in the neighborhood of his own dominions. Had Charles lived, it is possible that the tide of misfortune might have turned, but he was shot dead while engaged in besieging Frederikshall.

As Charles XII. had no children, it was doubtful whether the crown should pass to his younger sister Ulrica Eleonore or to Charles Frederick of Holstein-Gottorp, the son of his elder sister Hedvig Sophia. The nobles decided in favor of Ulrica Eleonore, who secured their support by undertaking to place all real power in their hands. In 1720 her authority was transferred to her husband, Prince Frederick of Hesse, who reigned as Frederick I. until his death in 1751.

Under Adolphus Frederick (1751–1771) Sweden took part in the Seven Years' War, siding with the enemies of Frederick the Great. But she was now so feeble, and her statesmen were so incompetent, that her intervention led to no serious results. Gustavus III., Adolphus Frederick's son (1771–1792), was a man of a very different temper from his indolent father. He had great energy of character, a thorough comprehension of some of the conditions of political progress, and a frank and persuasive manner. In early youth he seems to have convinced himself that it would be impossible for Sweden to become a prosperous country unless the royal authority were restored, and when at the age of twenty-five he succeeded his father he secretly resolved to make the crown supreme.

He carried out his plans with remarkable ability and caution. The members of the council of state were arrested, and the king received the homage of the leading authorities in the military, naval, and civil services. The diet was forthwith summoned, and at its first sitting Gustavus spoke of the lamentable condition of the kingdom, and of the need for more efficient methods of government. He had no wish, he said, to establish an absolute monarchy, but it was necessary that the supremacy of the aristocracy should be destroyed, and that the country should reëstablish the system which existed in the time of Gustavus Adolphus, when the crown and the diet had each its separate functions and worked cordially together. A new constitution, which had been drawn up, placing executive power wholly in the king's hands, was afterward read, and at once accepted.

Gustavus was greatly excited by the French Revolution and sought to form an alliance with Russia, Prussia and Austria for the restoration of Louis XVI. But the diet refused to support his wild schemes. Several nobles, desiring to avenge the supposed wrongs of their order, entered into a conspiracy against him, and in 1792 he was mortally wounded by an assassin who acted as their agent.

Gustavus IV. (1792–1809) was not quite fourteen years old when his father was murdered, and during his minority the government was carried on by his uncle the duke of Södermanland. Gustavus began to exercise royal authority in 1796. His reign was remarkable chiefly for the obstinacy with which he clung to his own ideas, no matter how far they might conflict with the obvious interests of his country. The Swedish people were so enraged by the consequences of his policy that in 1809 he was dethroned, and the claims of his descendants to the crown were also repudiated. He was succeeded by the duke of Södermanland, who reigned as Charles XIII.

Charles XIII. (1809–1818) concluded peace with Russia, Denmark and France, ceding to Russia by the treaty of Frederikshamm (1809) the whole of Finland. The loss of this territory, which had been so long associated with the Swedish monarchy, was bitterly deplored by the Swedes, but it was universally admitted that under the circumstances the sacrifice was unavoidable. Charles assented to important changes in the constitution, which were intended to bring to an end the struggle between the crown and the aristocracy and to provide some security for the maintenance of popular rights. The king was still to be at the head of the executive, but it was arranged that legislative functions and control over taxation should belong to the diet, which was to consist of four orders—nobles, clergymen, burghers and peasants.

As Charles XIII. was childless, the diet elected as his successor Prince Christian Augustus of Holstein-Sonderburg-Augustenburg. In 1810, soon after his arrival in Stockholm, this prince suddenly died; and Sweden astonished Europe by asking Marshal Bernadotte to become heir to the throne. Bernadotte, who took the name of Charles John, was a man of great vigor and resource, and soon made himself the real ruler of Sweden. Napoleon treated Sweden as almost a conquered country, and compelled her to declare war with England. Bernadotte, associating himself heartily with his adopted land, resolved to secure its independence, and entered into an alliance with Russia. In 1813 he started with an army of 20,000 Swedes to coöperate with the powers which were striving finally to crush the French emperor. The proceedings of the Swedish crown prince were watched with some suspicion by the allies as he was evidently unwilling to strike a decisive blow at France; but after the battle of Leipsic he displayed much activity. He blockaded Hamburg, and by the peace of Kiel, concluded in January 1814, he forced Denmark to give up Norway. He then entered France, but soon returned, and devoted his energies to the conquest of Norway, which was very unwilling to be united with Sweden. Between the months of July and November, 1814, the country was completely subdued, and Charles XIII. was proclaimed king. The union of Sweden and Norway, which has ever since been maintained, was recognized by the congress of Vienna.

In 1818 Bernadotte mounted the throne as Charles XIV., and he reigned until he died in 1844. Great material improvements were effected during his reign. He caused new roads and canals to be constructed; he encouraged the cultivation of districts which had formerly been barren; and he founded good industrial and naval schools. He was not, however, much liked by his subjects.

Charles XIV. was succeeded by his son Oscar I. (1844–1859). Oscar had always expressed sympathy with liberal opinions, and it was anticipated that the constitutional question would be settled during his reign without much difficulty. These expectations were disappointed.

Although the constitution was not reformed, much was done in other ways during the reign of Oscar I. to promote the national welfare. The result of the wise legislation of this period was that a new spirit of enterprise was displayed by the commercial classes, and that in material prosperity the people made sure and rapid progress.

Charles XV. (1859–1872) mounted the throne after his father's death. Nearly two years before his accession he had been made regent in consequence of Oscar I.'s ill-health. Charles was a man of considerable intellectual ability and of decidedly popular sympathies, and during his reign the Swedish people became enthusiastically loyal to his dynasty.

Early in the reign of Charles XV. there were serious disputes between Sweden and Norway, and the union of the two countries could scarcely have been maintained but for the tact and good sense of the king. He also exercised a steadying influence in 1863, when his people expressed passionate sympathy with the Poles in their insurrection against Russia, and with the Danes in their war with Prussia and Austria.

Charles XV. died in 1872, and was succeeded by his brother Oscar II., who still reigns (1890). Under him Sweden has maintained good relations with all foreign powers, and political disputes in the diet have never been serious enough to interrupt the material progress of the nation.

Literature.—Swedish literature, as distinguished from compositions in the common *norræna tunga* of old Scandinavia, cannot be said to exist earlier than the thirteenth century. Nor until the period of the Reformation was its development in any degree rapid or copious. The oldest form in which Swedish exists as a written language is the series of manuscripts known as *Landskapslagarne*, or "The Common Laws." These are supposed to be the relics of a still earlier age, and it is hardly believed that we even possess the first that was put down in writing. The most important and the most ancient of these codes is the *Elder West Göta Law*, reduced to its present form by the law-man Eskil about 1230.

In verse the earliest Swedish productions were probably the folk-songs. The age of these, however, has been commonly exaggerated. It is doubtful whether any still exist which are as old, in their present form, as the thirteenth century. The bulk are now attributed to the fifteenth, and many are doubtless much later still. The first book printed in the Swedish language appeared in 1495.

The sixteenth century added but little to Swedish literature, and that little is mostly connected with the newly-founded university of Upsala. The Renaissance scarcely made itself felt in Scandinavia, and even the Reformation failed to waken the genius of the country. Psalms and didactic spiritual poems were the main products of Swedish letters in the sixteenth century.

With the accession of Charles IX. and the consequent development of Swedish greatness, literature began to assert itself in more vigorous forms. The reign of Charles IX. saw the rise of secular drama in Sweden. The first comedy was the *Tisbe* of Magnus Olai Asteropherus (d. 1647), a coarse but witty piece on the story of Pyramus and Thisbe, acted by the school-boys of the college of Arboga in 1610. A greater dramatist was Johannes Messenius (1579–1636), who, having been discovered plotting against the government during the absence of Gustavus in Russia, was condemned to imprisonment for life—that is, for twenty years. Before this disaster he had been professor in Upsala, where his first historical comedy, *Disa*, was performed in 1611, and the tragedy of *Signill* in 1612.

The reign of Gustavus Adolphus was adorned by one great writer, the most considerable in all the early history of Sweden. The title of "the Father of Swedish Poetry" has been universally awarded to Göran Lilja, better known by his adopted name of Georg Stjernhjelm (1598–1672). This extraordinary man was born at Wika in Dalecarlia on August 7, 1598. His greatest poem, *Hercules*, is a didactic allegory in hexameters, written in very musical verse, and with an almost Oriental splendor of phrase and imagery. *Bröllops-Besvärs Ihugkommelse*, a sort of serio-comic epithalamium in the same measure, is another very brilliant work of Stjernhjelm. His masques, *Then Fagne Cupido* ("Cupid Caught") (1649), *Freds-afl* ("the Birth of Peace") (1649), and *Parnassus Triumphans* (1651), were written for the entertainment of the queen, and have a charming lyrical lightness.

The claim of Stjernhjelm to be the first Swedish poet may be contested by a younger man, but a slightly earlier writer, Gustaf Rosenhane (1619–1684), who was a reformer on quite other lines. Rosenhane took the French poets of the Renaissance for his models, and in 1650 wrote a cycle of one hundred sonnets, the earliest in the language; these were published under the title *Venerid* in 1680.

Of a rhyming family of Hjärne, it is enough to mention one member, Urban Hjärne (1641–1724), who introduced the new form of classical tragedy from France, in a species of transition from the masques of Stjernhjelm to the later regular rhymed dramas. His best play was a *Rosimunda*. Lars Johansson (1642–1674), who called himself "Lucidor the Unfortunate," has been the subject of a whole tissue of romance, most of which is fabulous. It is true, however, that he was stabbed, like Marlowe, in a midnight brawl at a tavern. His poems were posthumously collected as *Flowers of Helicon, Plucked and Distributed on various occasions by Lucidor the Unfortunate.* Stripped of the myth which had attracted so much attention to his name, Lucidor proves to be an occasional rhymster of a very low order. Haquin Spegel (1645–1714), the famous archbishop of Upsala, wrote a long didactic epic in alexandrines, *God's Labor and Rest*, with an introductory ode to the Deity in rhymed hexameters. He was also a good writer of hymns. Another ecclesiastic, the bishop of Scara, Jesper Svedberg (1653–1735), wrote sacred verses, but is better remembered as the father of Swedenborg. Peter Lagerlöf (d. 1699) cultivated a pastoral vein in his *Elisandra* and *Lucillis;* he was professor of poetry, that is to say, of the art of writing Latin verses, at Upsala. Olof Wexionius (1656–1690?) published his *Sinne-Afvel*, a collection of graceful miscellaneous pieces, in 1684, in an edition of only 100 copies. We have hitherto considered only the followers of Stjernhjelm; we have now to speak of an important writer who followed in the footsteps of Rosenhane. Gunno Eurelius, afterward ennobled with the name of Dahlstjerna (1661–1709) early showed an interest in the poetry of Italy. In 1690 he translated Guarini's *Pastor Fido*, and in or just after 1697 published, in a folio volume without a date, his *Kunga-Skald*, the first original poem in *ottava rima* produced in Swedish.

In prose the seventeenth century produced but little of importance in Sweden. Gustavus Adolphus (1594–1632) was the most polished writer of its earlier half, and his speeches take an important place in the development of the language. The most original mind of the next age was Olof Rudbeck (1630–1702), the famous author of *Atland er Manhem*.

A much more brilliant period followed the death of Charles XII. The influence of France and England took the place of that of Germany and Italy. This Augustan period in Sweden closed somewhat abruptly about 1765. Two writers in verse connect it with the school of the preceding century. Jacob Frese (1691–1729), whose poems were published in 1726, was an elegiacal writer of much grace, who foreshadowed the idyllic manner of Creutz. Samuel von Triewald (1688–1743) played a very imperfect Dryden to Dalin's Pope. He was the first Swedish satirist, and introduced Boileau to his countrymen. His *Satire upon our Stupid Poets* may still be read with entertainment. Both in verse and prose Olof von Dalin (1708–1763) takes a higher place than any writer since Stjernhjelm. He was inspired by the study of his great English contemporaries. His *Swedish Argus* (1733–34) was modeled on Addison's *Spectator*, his *Thoughts about Critics* (1736) on Pope's *Essay on Criticism*, his *Tale of a Horse* on Swift's *Tale of a Tub*. Dalin's style, whether in prose or verse, was of a finished elegance.

The only poet of importance who contested the laurels of Dalin was a woman. Hedvig Charlotta Nordenflycht (1718–1763) was the center of a society which ventured to rival that which Queen Ulrica Eleonore created and Dalin adorned. Both groups were classical in taste, both worshiped the new lights in England and France. Fru Nordenflycht wrote with facility and grace; her collection of lyrics, *The Sorrowing Turtledove* (1743), in spite of its affectation, enjoyed and merited a great success. It was to Fru Nordenflycht's credit that she discovered and encouraged the talent of two very distinguished poets younger than herself, Creutz and Gyllenborg. Gustaf Filip Creutz (1729–1785) was a Finlander who achieved an extraordinary success with his idyllic poems, and in particular with the beautiful pastoral of *Atis och Camilla*, long the most popular of all Swedish poems. In 1763, the year of the death of Dalin and of Fru Nordenflycht, Creutz ceased to write, having been appointed minister to Spain; he gave up poetry for politics. Gustaf Frederik Gyllenborg (1731–1808) was a less accomplished poet, less delicate and touching, more rhetorical and artificial. His epic *Taget öfver Bält* ("The Expedition Across the Belt") (1785) is an imitation, in twelve books, of Voltaire's *Henriade*, and deals with the prowess of Charles X. It is impossible to read it. He wrote fables, allegories, and satires.

In prose, as was to be expected, the first half of the eighteenth century was rich in Sweden as elsewhere. The first Swedish novelist was Jakob Henrik Mörk (1714–1763). Jakob Wallenberg (1746–1778) described a voyage he took to the East Indies and China under the very odd title of *Min Son pa Galejan* ("My Son at the Galleys"), a work full of humor and originality. Karl Gustaf Tessin (1695–1770) wrote on politics and on esthetics. Anders Johan von Höpken (1712–1789), the friend of Ulrica Eleonore, was a master of rhetorical compliment in addresses and funeral orations. In spite of all the encouragement of the court, drama did not flourish in Sweden. Among the tragedians of the age we may mention Dalin, Gyllenborg, and Erik Wrangel (d. 1765). In comedy Reinhold Gustaf Modée (d. 1752) wrote three good plays in rivalry of Holberg. In science Linnæus, or Karl von Linné (1707–1778), was the name of the greatest genius in the whole century; but he wrote almost entirely in Latin. The two great Swedish chemists, Torbern Olof Bergman (1735–1784) and Karl Vilhelm Scheele (1742–1786), flourished at this time. In pathology a great name was left by Nils Rosén von Rosenstein (1706–1773), in navigation by Admiral Fredrik Henrik af Chapman (d. 1808), in philology by Karl Aurivillius (d. 1786). But these and other distinguished savants whose names might be enumerated scarcely belong to the history of Swedish literature. The same may be said about that marvelous and many-sided genius, Emanuel Swedenborg (1688–1772), who, though the son of a Swedish poet, preferred to prophesy to the world in Latin.

The royal personages of Sweden have commonly been protectors of literature; they have strangely often been able men of letters themselves. Gustavus III. (1746–1792), the founder of the Swedish Academy and of the Swedish theater, was himself a playwright of no mean ability. The principal writers of the reign of Gustavus III. bear the name of the Academical school. But we must first consider a writer of genius who had nothing academical in his composition.

Karl Mikael Bellman (1740–1795), the most original and one of the most able of all Swedish writers, was an improvisatore of the first order. The riot of his dithyrambic hymns sounded a strange note of nature amid the conventional music of the Gustavians. Of the academical poets Johan Gabriel Oxenstjerna (1750–1818), the nephew of Gyllenborg, was a descriptive idyllist of grace. He translated *Paradise Lost*. A writer of far more power and versatility was Johan Henrik Kellgren (1751–1795), the leader of taste in his time (see KELLGREN). He was the first writer of the end of the century in Sweden, and the second undoubtedly was Karl Gustaf af Leopold (1756–1829), "the blind seer Tiresias-Leopold," who lived on to represent the old school in the midst of romantic times.

The excellent lyrical poet Franz Mikael Franzén (1772–1847), and a belated academician Johan David Valerius (1776–1852), fill up the space between the Gustavian period and the domination of romantic ideas from Germany. It was Lorenzo Hammarsköld (1785–1827) who in 1803 introduced the views of Tieck and Schelling by founding the society in Upsala called "Vitterhetens Vänner" (see HAMMARSKÖLD). This passed away, but was succeeded in 1807 by the famous "Aurora förbundet," founded by two youths of genius, Per Daniel Amadeus Atterbom (1790–1855) and Vilhelm Frederik Palmblad (1788–1852).

In 1811 certain young men in Stockholm founded a society for the elevation of society by means of the study of Scandinavian antiquity. This was the Gothic Society, which began to issue the magazine called *Iduna* as its organ. Of its patriotic editors the most prominent was Erik Gustaf Geijer (1783–1847), but he was presently joined by a young man slightly older than himself, Esaias Tegnér (1782–1846), afterward bishop of Vexiö, the greatest of Swedish writers. Even more enthusiastic than either in pushing to its last extreme the worship of ancient myths and manners was Per Henrik Ling (1776–1839), now better remembered as the father of gymnastic science than as a poet.

From 1810 to 1840 was the blossoming-time in Swedish poetry, and there were several writers of distinguished merit who could not be included in either of the groups enumerated above. Second only to Tegnér in genius, the brief life and mysterious death of Erik Johan Stagnelius (1793–1823) have given a romantic interest to all that is connected with his name. His first publication was the epic of *Vladimir the Great* (1817); to this succeeded the romantic poem *Blanda*. His singular dramas, *The Bacchantes* (1822), *Sigurd Ring*, which was posthumous, and *The Martyrs* (1821) are esteemed by many critics to be his most original productions. Erik Sjöberg, who called himself "Vitalis" (1794–1828), was another gifted writer whose career was short and wretched. Two humorous poets of the same period who deserve mention are Johan Anders Wadman (1777–1837), an improvisatore of the same class as Bellman, and Kristian Erik Fahlcrantz (1790–1866), bishop of Vesteras, whose humorous polemical poem of *Noah's Ark* (1825) is a masterpiece.

The first prosaist of the time was, without question, the novelist Karl Jonas Ludvig Almqvist (1793–1866), around whose extraordinary personal character and career a mythical romance has already collected. Frederik Cederborgh (1784–1835) revived the comic novel of his *Uno von Trasenberg* and *Ottar Tralling*. Swedish history supplied themes for the romances of Count Per Georg Sparre (1790–1871) and of Gustaf Henrik Mellin (1803–1876). But all these writers sink before the sustained popularity of the Finnish poetess Fredrika Bremer (1801–1865), whose stories have reached farther into the distant provinces of the world of letters than the writings of any other Swede except Tegnér. She was preceded by Sofia Zelow, afterward Baroness von Knorring (1797–1848), who wrote a long series of aristocratic novels.

At the beginning of the romantic period a high position was taken as an independent thinker by Benjamin Höijer (1767–1812), who owed much at the outset to Kant and Fichte. Geijer also distinguished himself in philosophical writing, but the most original of Swedish philosophers has been Kristofer Jakob Boström (1797–1866), a peripatetic talker, who wrote little, but whose system has been reduced to literature by K. Claëson (1827–1859), Professor Axel Nyblæus (b. 1821), and other disciples. A polemical writer of great talent was Magnus Jakob Crusenstolpe (1795–1865), of whose work it has been said that "it is not history and it is not fiction, but something brilliant between the one and the other." As an historian of Swedish literature Per Wieselgren (1800–1877) has composed a valuable work, and he has made other valuable contributions to history and bibliography. In history we meet again with the great name of Geijer, with that of Jonas Hallenberg (1748–1834), and with that of Anders Magnus Strinnholm (1786–1862), whose labors in the field of Swedish history were extremely valuable. Geijer and Strinnholm prepared the way for the most popular and perhaps the greatest of all Swedish historians, Anders Fryxell (1795–1881), whose famous *Berättelser ur Svenska Historien* appeared in parts during a space of nearly sixty years, an extraordinary example of persistent and uninterrupted work. As a legal historian the first place is easily maintained by Karl Johan Schlyter (b. 1795). Hans Järta (1774–1847) was a statesman who wrote with vigor on economical subjects. In science it is only possible to mention the celebrated names of Jöns Jakob Berzelius (1779–1848) the chemist, Elias Fries (1794–1878) the botanist, Karl Adolf Agardh (1785–1859) the physiologist, and Sven Nilsson (1787–1883) the palæontologist.

In the generation which has just passed away, the first poet of Sweden, without a rival, was Johan Ludvig Runeberg (1804–1877), who divides with Tegnér the highest honor in Swedish literature. The other leading verse-writers were Karl Vilhelm Böttiger (1807–1878), the son-in-law and biographer of Tegnér; Johan Börjesson (1790–1866), the last of the Phosphorists, author of various romantic dramas; Vilhelm August von Braun (1813–1860), a humorous lyrist; "Talis Qualis," whose real name was Karl Vilhelm August Strandberg (1818–1877); and August Teodor Blanche (1811–1868), the popular dramatist. But Runeberg is the only great poetic name of this period. In prose there was not even a Runeberg. Novel-writing was sustained at no very high level by Karl Anton Wetterbergh (b. 1804), who called himself "Onkel Adam," by Emilie Carlén (b. 1807), whose autobiography has lately appeared, by Oskar Patrick Sturzen-Becker, "Orvar Odd," (1811–1869), by August Blanche, and by Marie Sofia Schwartz (b. 1819). Lars Johan Hierta (1801–1872) was the leading journalist, Johan Henrik Thomander, bishop of Lund (1798–1865), the greatest orator, Matthias Alexander Castrén (1813–1852) a prominent man of science, and Karl Gustaf af Forsell (1783–1848) the principal statistician of this not very brilliant period. Elias Lönnrot (1802–1884), is distinguished as the Finnish professor who discovered and edited the *Kalevala*. It is impossible to give an exhaustive list of names in so short a sketch as this.

Swedish literature is not in a very lively condition at the present time. The most popular poet is the Finn, Zakris Topelius (b. 1818). Of a higher artistic merit are the finished lyrics of Count Karl Snoilsky (b. 1841). King Oscar II. (b. 1829) is a genuine poet of the second order, as his father Charles XV. was of the third. Karl David af Wirsén (b. 1842) is an active writer on the conservative side. The best living author of Sweden is undoubtedly Viktor Rydberg (b. 1829), who has written masterly novels and historical works. The latest influences from Denmark and France are beginning to be represented by Strindberg the novelist, and by Fru A. Ch. Edgren, the most successful Swedish dramatist of the moment.

SWEDENBORG, or SVEDBERG, EMANUEL (1688–1772), was born at Stockholm January 29, 1688. Having completed his university course at Upsala, in 1710 he commenced the customary European tour, visiting England, Holland, France, and Germany, studying especially natural philosophy, though alternating it with the composition of Latin verses, little of the poet as there was in his nature. In 1715 he returned to Upsala, and devoted himself to natural science and various engineering works. From 1716 to 1718 he published a scientific periodical, called *Dædalus Hyperboreus*, a record of mechanical and mathematical inventions and discoveries. In 1716 he was introduced to Charles XII., who appointed him assessor in the Swedish college of mines. Two years later he distinguished himself at the king's siege of Frederikshall by the invention of machines for the transport of boats and galleys overland from Stromstadt to Iddefjord, a distance of fourteen English miles. The same year he published various mathematical and mechanical works. At the death of Charles XII. Queen Ulrica elevated him and his family to the rank of nobility, by which his name was changed from Svedberg to Swedenborg. The next years were devoted to the duties and studies connected with his office, which involved the visitation of the Swedish, Saxon, Bohemian, and Austrian mines. In 1724 he was offered the chair of mathematics in the university of Upsala, which he declined. Gradually his inquiring and philosophical mind led him to wider studies than those of his profession. As early as 1721 he was seeking to lay the foundation of a scientific explanation of the universe, when he published his *Prodromus Principiorum Rerum Naturalium* and had already written his *Principia* in its first form. Thirteen years later, in 1734, appeared in three volumes *Opera Philosophica et Mineralia*, the first volume of which (his *Principia*) contained his view of the first principles of the universe, a curious mechanical and geometrical theory of the origin of things. The same year followed *Prodromus Philosophiæ ratiocinantis de Infinito et Causa Finali Creationis*, which treats of the relation of the finite to the infinite and of the soul to the body, seeking to establish a nexus in each case as a means of overcoming the difficulty of their relation. From this time he applied himself to the problem of discovering the nature of soul and spirit by means of anatomical studies. He traveled in Germany, France, and Italy in quest of the most eminent teachers and the best books dealing with the human frame, and published, as the results of his inquiries, among other works, his *Œconomia Regni Animalis* (London, 1740-41) and *Regnum Animale* (The Hague, 1744-45, London, 1745) But a profound change was coming over him which was to make of the scientific inquirer the supernaturalist prophet. Neither by geometrical, nor physical, nor metaphysical principles had he succeeded in reaching and grasping the infinite and the spiritual, or in elucidating their relation to man and man's organism, though he had caught glimpses of facts and methods which he thought only required confirmation and development. Late in life he wrote to Oetinger that "he was introduced by the Lord first into the natural sciences, and thus prepared, and, indeed, from the year 1710 to 1744, when heaven was open to him." From that time he gave up all worldly learning, and labored solely to expound spiritual things But it was some time before he became quite at home in the spiritual world. In the year 1747 he resigned his post of assessor of the college of mines that he might devote himself to his higher vocation, requesting only to be allowed to receive as a pension the half of his salary. He took up afresh his study of Hebrew, and began his voluminous works on the interpretation of the Scriptures. The principal of these is the *Arcana Cœlestia* in eight quarto volumes, which he printed in London between 1749 and 1756, professing to have derived the whole of it by direct illumination from the Almighty Himself, and not from any spirit or angel. His later work *De Cœlo et de Inferno* (London, 1758) consists of extracts and portions of the *Arcana*. His MS. work *Apocalypsis Explicata*, expounding the doctrines of the New Church, was prepared in 1757-59. In 1763 appeared his *Sapientia Angelica de Divino Amore et de Divina Sapientia*, containing the most philosophical brief account of the principles of the New Church, and his subsequent writings were voluminous. His life from 1747 was spent alternately in Sweden, Holland, and London, in the composition of his works and their publication, till his death, which took place in London, March 29, 1772.

SWEDENBORGIANISM. Swedenborgianism, as professed by Swedenborg's followers, is based on the belief of Swedenborg's claims to have witnessed the last judgment, or the second advent of the Lord, with the inauguration of the New Church through the new system of doctrine promulgated by him and derived from the Scriptures, into the true sense of which he was the first to be introduced. The doctrines of the New Church are those of the internal sense of the word as revealed to Swedenborg, who received them into his understanding and published them through the press and not as a preacher. They are briefly—(1) that the Lord Jesus Christ is the only God, that in Him there is the Trinity of Father, Son, and Holy Ghost, the Father being His infinite divine nature or soul, the Son His glorified human nature or divine body, and the Holy Spirit the life proceeding from His divine humanity for the salvation of man; (2) that the Father in His eternal humanity descended as the Lord Jesus Christ to the earth, assuming fallen human nature, that in it he might conquer hell and deliver mankind from its influence; (3) that the Sacred Scriptures are the true word of God, accommodated to the understanding of angels and men, and constituting the perpetual medium between heaven and the church, the law of correspondence having been revealed by the Lord to Swedenborg as the key for their interpretation; (4) that man is not saved by faith alone but by a life according to the word, the summary of which is the decalogue; (5) that heaven is made up of those who keep God's commandments and love Him and His kingdom, and hell of those who love themselves and the world; (6) that the spiritual world—heaven and hell—holds the same relation to the natural world and its inhabitants as the soul to the body, being in and around the natural world and its life, and that after the death of the body the spirit continues to live in the spiritual world it had previously though unconsciously inhabited. Swedenborgians now constitute a widely spread and considerable society, with a regularly constituted ecclesiastical organization and a zealous missionary activity. The report of the General Convention of the New Jerusalem in the United States, 1890, gives the names of 125 societies in America, with 140 ordinary ministers. In England there are seventy-two churches with a membership of nearly 70,000. In Italy, Sweden, and Prussia there is a Swedenborg mission sustained by help from England and America. In South Germany there exist congregations of the New Church, and the librarian of the university of Tübingen, Dr. Immanuel Tafel, was exceedingly active until his death (1863) in the publication and translation of Swedenborg's works, and in the vindication of the doctrines of the New Church. In Austria, Norway, and Switzerland also there are congregations. But, in addition to full converts to Swedenborgianism, a considerable number of prominent theologians and other thinkers have been attracted by Swedenborg's works and parts of his system. While the extravagant anthropomorphism, the mechanical materialism, the theological narrowness, the wild allegorizing, the entire absence of historical knowledge, and the astounding prophetic claims of the man and his system—in a word, the Gnosticism of Swedenborg and his followers—must be offensive to philosophical minds, they can discover in his writings and the drift of his thought fine ethical views, profound glances of insight into the depths of the universe—God, nature, man, and his destiny.

SWEET POTATO. See POTATO, SWEET.

SWIFT, a bird so called from the extreme speed of its flight, the *Hirundo apus* of Linnæus and *Cypselus apus* or *murarius* of modern ornithologists, who have at last learned that it has only an outward resemblance but no near affinity to the Swallow or its allies.

The Swift commonly chooses its nesting-place in holes under the eaves of buildings, but a crevice in the face of a quarry, or even a hollow tree, will serve it with the accommodation it requires. This indeed is not much, since every natural function, except sleep, oviposition, and incubation, is performed on the wing, and the easy evolutions of this bird in the air, where it remains for hours together, are the admiration of all who witness them. Though considerably larger than a Swallow, it can be recognized at a distance less by its size than by its peculiar shape. The head scarcely projects from the anterior outline of the pointed wings, which form an almost continuous curve, at right angles to which extend the body and tail, resembling the handle of the crescentic cutting-knife used in several trades; while the wings represent the blade. The mode of flight of the two birds is also unlike, that of the Swift being much more steady, and, rapid as it is, ordinarily free from jerks. The whole plumage, except a grayish-white patch under the chin, is a sooty black, but glossy above. Though its actual breeding-places are by no means numerous, its extraordinary speed and discursive habits make the Swift widely distributed; and scarcely a summer's day passes without its being seen in most places. A larger species *C. melba* or *C. alpinus*, with the lower parts dusky white, has its home in many of the mountainous parts of central and southern Europe, and a very distinct genus, *Acanthyllis* (or *Chætura*), has its home in northern Asia.

The genus *Cypselus*, as noted by Willoughby with its American ally *Panyptila*, exhibits a form of pedal structure not otherwise observed among birds. Not only is the hind-toe constantly directed forward, but the other three toes depart from the rule which ordinarily governs the number of phalanges in the Bird's foot—a rule which applies to even so ancient a form as *Archæopteryx*—and in the two Cypseline genera just named the series of digital phalanges is 2, 3, 3, 3, instead of 2, 3, 4, 5, which generally obtains in the Class *Aves*. Other Swifts, however, do not depart from the normal arrangement.

SWIFT, JONATHAN, dean of St. Patrick's, the greatest satirist of his own or perhaps of any age, was born in Hoey's Court, Dublin, November 30, 1667.

In April, 1682, Swift matriculated at Trinity College, Dublin, where he failed to distinguish himself. "By the ill-treatment of his nearest relations," he says, meaning especially his uncle Godwin, "he was so discouraged and sunk in his spirits that he too much neglected his academic studies, for some part of which he had no great relish by nature; so that when the time came for taking his degree as bachelor of arts he was stopped of his degree for dullness and insufficiency, and at last hardly admitted in a manner little to his credit, which is called in that college *speciali gratia*, February 15, 1685." The college roll, nevertheless, shows that the only subject in which Swift absolutely failed was natural philosophy, including mathematics, in which the future author of the *Voyage to Laputa* was hardly likely to excel, nor is it surprising that a student of fitful and unruly temperament should have performed his obligatory theme *negligenter*. His examination in Greek and Latin was satisfactory, and the extent of desultory information evinced by his writings seems to prove that he had always been an industrious reader. His mortification made him reckless, and he repeatedly underwent academic censure during the next three years, though it is not certain whether some of the records supposed to apply to him do not in fact relate to his cousin Thomas.

In 1688 Swift quitted the university, and, after a brief residence with his mother at Leicester, entered the family of Sir William Temple at Moor Park, near Farnham, as he declares for the advantage of Temple's conversation, but at least partly as an amanuensis. He withdrew from Temple's service on a pretext of ill health from May, 1690, to August, 1691, but returned, and undoubtedly made himself useful to his employer. Swift had already (July, 1692) proceeded to the degree of M.A. at Oxford, and the execution of his design to embrace the ecclesiastical profession was hastened by a quarrel with Temple, occasioned by the latter's reluctance to contract any definite engagement to provide for him. Throwing up his employment, he passed (May, 1694) over into Ireland, but found his views impeded by the refusal of all the bishops to ordain him without some certificate of the regularity of his deportment while in Temple's family. Five months passed ere he could bring himself to solicit this favor from his old patron, which he ultimately did in a letter submissive in appearance, but charged to the full with smothered rage and intense humiliation. Forgiveness was easy to one in Temple's place and of Temple's disposition, and he not only dispatched the requisite testimonials, but added a recommendation which obtained for Swift the living of Kilroot, in the diocese of Down and Connor (January, 1695). His residence here was not fated to be of long duration. Temple, who knew his value and had not parted with him willingly, soon let him understand that a return was open to him, and Swift, whose resentment was cooled by time, and soothed by the acknowledgment of his value to his patron, readily complied (May, 1696). He continued to reside with Sir William till the latter's death in January, 1699. No further disagreement troubled their intimacy, and Temple bequeathed Swift the charge of editing his writings, a laborious but not an unprofitable commission.

Macaulay has justly indicated the familiarity with public affairs acquired by Swift at Moor Park as one main cause of his subsequent distinction as a politician, and here too he laid the foundation of his literary renown. He is reported to have read regularly for eight hours every day; and we have his own authority for his having, as early as 1691, "written and burned, and written again, more on all manner of subjects than perhaps any man in England." The only relics of these early days, however, belong to a species of composition in which he was little qualified to excel. He has, indeed, a name among the poets of England, but the merit of his verse is usually in the ratio of its approach to the *sermo pedestris*. Mistaking the nature of his powers, he must needs begin with Pindarics, and the result may be imagined. Yet his own simple account of his feelings while endeavoring composition proves that the mood was right though the channel was wrong, and that there was error as well as truth in his kinsman Dryden's severe and unforgiven remark, "Cousin Swift, you will never be a poet." Swift's first prose composition betrayed his resentment. In the *Battle of the Books* (1697), a satirical contribution to the controversy on the comparative merits of the ancients and the moderns raised by Perrault, but with especial reference to the question of the genuineness of the letters of Phalaris, on which his patron Temple had taken the wrong side, Swift for the first and last time committed a plagiarism, and sought to conceal it by an untruth. Swift's next literary labor was his edition of Temple's posthumous works, already mentioned. They appeared with a dedication to King William, which was to have made the editor a prebendary. A petition to this effect miscarried, as he always believed, through the negligence or ill-will of the nobleman who undertook to present it. Be this as it may, he had become too important to be overlooked, and soon obtained the post of secretary and chaplain to Earl Berkeley, one of the lords justices of Ireland.

Swift shortly after threw up his chaplaincy, but was ultimately reconciled to his patron by the presentation to the rectory of Agher, in Meath, with the united vicarages of Laracor and Rathbeggan. For the first time in his life he might now call himself his own master, and had an opportunity of exhibiting, free from suspicion of external constraint, that stern regard to duty which was not the least prominent feature of his character. In an age of general laxity—in a priest of an alien church, whose most energetic servants commonly succumbed to the mortifying conviction of their uselessness and the detestation they excited among the people for whom they labored, the parishioners of Laracor found a clergyman whom they might have heard three times a week. The energy, however, which probably gained the respect, certainly failed to influence the convictions, of his Catholic flock. We have his own authority for reckoning his average congregation at "half a score;" and on one occasion his clerk Roger was his only auditor. In fact, his exertions in the pulpit were more meritorious than his achievements; he entirely lacked the fire, the self-oblivion, the expansive geniality of the orator. He himself characterized his discourses as "pamphlets," and, if meant to imply their arid and argumentative character, the criticism is just. The author of the *Tale of a Tub*, which he had had by him since 1696 or 1698, must have felt conscious of powers capable of far more effective exercise; and his resolution to exchange divinity for politics must appear fully justified on a comparison of these inconclusive essays with another performance of the same period. The *Discourse on the Dissensions in Athens and Rome* (September, 1700), written in the Whig interest, "without humor and without satire," and intended as a dissuasive from the pending impeachment of Somers and three other noblemen, received the honor, extraordinary for the maiden publication of a young politician, of being generally attributed to Somers himself or to Burnet, the latter of whom found a public disavowal necessary. Three years and a half later appeared a more remarkable work. Clearness, cogency, masculine simplicity of diction, are conspicuous in the pamphlet, but true creative power told the *Tale of a Tub.*

Before the publication of the *Tale of a Tub*, Swift had taken a step destined to exercise a most important influence on his life, by inviting two ladies to Laracor. Esther Johnson, a dependant of Sir William Temple's (born in March, 1681), whose acquaintance he had made in the latter's family, and whom he has immortalized as "Stella," came over with her chaperon, Mrs. Dingley, and was soon permanently domiciled in his neighborhood. The melancholy tale of Swift's attachment will be more conveniently narrated in another place, and is only alluded to here for the sake of chronology. Meanwhile the sphere of his intimacies was rapidly widening. He had been in England for three years together, 1701 to 1704, and counted Pope, Steele, and Addison among his friends. The success of his pamphlet gained him ready access to all Whig circles; but already his confidence in that party was shaken, and he was beginning to meditate that change of sides which has drawn down upon him so much but such unjustifiable obloquy. The true state of the case may easily be collected from his next publications—*The Sentiments of a Church of England Man*, and *On the Reasonableness of a Test* (1708). The vital differences among the friends of the Hanover Succession were not political, but ecclesiastical. From this point of view, Swift's sympathies were entirely with the Tories. One of his pamphlets, written about this time, contains his recipe for the promotion of religion, and is of itself a sufficient testimony to the extreme materialism of his views. Censorships and penalties are among the means he recommends. His pen was exerted to better purpose in the most consummate example of his irony, the *Argument against Abolishing Christianity.* About this time, too (November, 1707), he produced his best poem, *Baucis and Philemon*, which, as he frankly tells us, owes very much to the corrections of Addison.

From February, 1708, to April, 1709, Swift was in London, urging upon the Godolphin administration the claims of the Irish clergy to the first-fruits and tenths ("Queen Anne's bounty") already granted to their brethren in England. His having been selected for such a commission shows that he was not yet regarded as a deserter from the Whigs, although the ill-success of his representations probably helped to make him one. By November, 1710, he was again domiciled in London, and writing his *Journal to Stella*, that unique exemplar of a giant's playfulness, "which was written for one person's private pleasure and has had indestructible attractiveness for every one since." In the first pages of this marvelously minute record of a busy life we find him depicting the decline of Whig credit and complaining of the cold reception accorded him by Godolphin, whose penetration had doubtless detected the precariousness of his allegiance. Within a few weeks he had become the lampooner of the fallen treasurer, the bosom friend of Oxford and Bolingbroke, and the writer of the *Examiner*, a journal established as the exponent of Tory views (November, 1710). He was now a power in the state, the intimate friend and recognized equal of the first writers of the day, the associate of ministers on a footing of perfect cordiality and familiarity. For a brief time he seemed to resume the whole power of the English press in his own pen and to guide public opinion as he would. His services to his party as writer of the *Examiner*, which he quitted in July, 1711, were even surpassed by those which he rendered as the author of telling pamphlets, among which *The Conduct of the Allies* and *Remarks on the Barrier Treaty* (November and December, 1711) hold the first rank. There seems no reason to suppose that he was consulted respecting the great Tory strokes of the creation of the twelve new peers and the dismissal of Marlborough (December, 1711), but they would hardly have been ventured upon if *The Conduct of the Allies* and the *Examiners* had not prepared the way. A scarcely less important service was rendered to the ministry by his *Letter to the October Club*, artfully composed, to soothe the impatience of Harley's extreme followers. He had every claim to the highest preferment that ministers could give him, but his own pride and prejudice in high places stood in his way.

Generous men like Oxford and Bolingbroke cannot have been unwilling to reward so serviceable a friend, especially when their own interest lay in keeping him in England. Notwithstanding, therefore, some dubious expressions in Swift's letters, natural to the deferred hope, we need not doubt their having actually used their best efforts to obtain for him the vacant see of Hereford. Swift, however, had formidable antagonists in the archbishop of York, whom he had scandalized, and the duchess of Somerset, whom he had satirized. Anne was particularly amenable to the influence of priestly and female favorites, and it must be considered a proof of the strong interest made for Swift that she was eventually persuaded to appoint him to the deanery of St. Patrick's, Dublin, vacant by the removal of Bishop Sterne to Dromore. It is to his honor that he never speaks of the queen with resentment or bitterness. In June, 1713, he set out to take possession of his dignity, and encountered a very cold reception from the Dublin public. The dissensions between the chiefs of his party speedily recalled him to England. Swift's endeavors after an accommodation were as fruitless as unremitting. His mortification was little likely to temper the habitual virulence of his pen, which rarely produced anything more acrimonious than the attacks he at this period directed against Burnet and his former friend Steele. One of his pamphlets against the latter (*The Public Spirit* *of the Whigs*) was near involving him in a prosecution, some invectives against the Scots having proved so exasperating to the peers of that nation that they repaired in a body to the queen to demand the punishment of the author, of whose identity there could be no doubt, although, like all Swift's writings, except the *Proposal for the Extension of Religion*, the pamphlet had been published anonymously. The immediate withdrawal of the offensive passage, and a sham prosecution instituted against the printer, extricated Swift from his danger.

Meanwhile the crisis had arrived, and the discord of Oxford and Bolingbroke had become patent to all the nation. Foreseeing, as is probable, the impending fall of the former, Swift retired to Upper Letcombe, in Berkshire, and there spent some weeks in the strictest seclusion. Almost the first acts of Bolingbroke's ephemeral premiership were to order him 1,000 pounds from the exchequer and dispatch him the most flattering invitation. The same post brought a letter from Oxford, soliciting Swift's company in his retirement; and, to the latter's immortal honor, he hesitated not an instant in preferring the solace of his friend to the offers of St. John. When, a few days afterward, Oxford was in prison and in danger of his life, Swift begged to share his captivity; and it was only on the offer being declined that he finally directed his steps toward Ireland, where he was very ill received. The draft on the exchequer was intercepted by the queen's death.

These four busy years of Swift's London life had not been entirely engrossed by politics. First as the associate of Steele, with whom he quarreled, and of Addison, whose esteem for him survived all differences, afterward as the intimate comrade of Pope and Arbuthnot, the friend of Congreve and Atterbury, Parnell and Gay, he entered deeply into the literary life of the period. He was treasurer and a leading member of the Brothers, a society of wits and statesmen which recalls the days of Horace and Mæcenas. He promoted the subscription for Pope's *Homer*, contributed some numbers to the *Tatler*, *Spectator*, and *Intelligencer*, and joined with Pope and Arbuthnot in establishing the Scriblerus Club, writing *Martinus Scriblerus*, his share in which can have been but small, as well as *John Bull*, where the chapter recommending the education of all blue-eyed children in depravity for the public good must surely be his. His fugitive productions during this period are very numerous, and mostly distinguished not only by pungent wit but by overflowing animal spirits. The most celebrated are the cruel but irresistibly ludicrous satires on the astrologer Partridge, a man in fact respectable for his sincere belief in his art, and no mean writer. Many of his best poems belong to this period. A more labored work, his *Memorial* to Harley, proposing the regulation of the English language by an academy, is chiefly remarkable as a proof of the deference paid to French taste by the most original English writer of his day. His *History of the Last Four Years of Queen Anne* is not on a level with his other political writings. To sum up the incidents of this eventful period of his life, it was during it that he lost his mother, always loved and dutifully honored, by death; his sister had been estranged from him some years before by an imprudent marriage, which, though making her a liberal allowance, he never forgave.

In 1716 he had married secretly the Stella (Esther Johnson) of his earlier writings, and had been involved in complications with Vanessa (Miss Vanhomrig), the matter finally culminating in the latter's death on her discovery of the relations between Stella and Swift. Five years later Stella died, the unacknowledged wife and suspected mistress of Swift.

Between the death of Vanessa and the death of Stella, as though withheld by an evil fate until he could no longer enjoy them, came the greatest political and the greatest literary triumph of Swift's life. He had fled to Ireland, a broken man, to all appearance politically extinct; a few years were to raise him once more to the summit of popularity, though power was forever denied him. With his fierce hatred of what he recognized as injustice, it was impossible that he should not feel exasperated at the gross misgovernment of Ireland for the supposed benefit of England, the systematic exclusion of Irishmen from places of honor and profit, the spoliation of the country by absentee landlords, the deliberate discouragement of Irish trade and manufactures. An Irish patriot, in the strict sense of the term, he was not; he looked upon the indigenous population as conquered savages; but his pride and sense of equity alike revolted against the stay-at-home Englishmen's contemptuous treatment of their own garrison, and he delighted in finding a point in which the triumphant faction was still vulnerable. His *Proposal for the Universal Use of Irish Manufactures*, published anonymously in 1720, urging the Irish to disuse English goods, became the subject of a prosecution, which at length had to be dropped. A greater opportunity was at hand. One of the chief wants of Ireland in that day, and for many a day afterward, was that of small currency adapted to the daily transactions of life. Questions of coinage occupy a large part of the correspondence of the primate, Archbishop Boulter, whose anxiety to deal rightly with the matter is evidently very real and conscientious. There is no reason to think that the English ministry wished otherwise; but secret influences were at work, and a patent for supplying Ireland with a coinage of copper halfpence was accorded to William Wood on such terms that the profit accruing from the difference between the intrinsic and the nominal value of the coins, about 40 per cent., was mainly divided between him and the duchess of Kendal, the king's mistress, by whose influence he had obtained the privilege. Swift now had his opportunity, and the famous letters signed M. B. Drapier (1724) soon set Ireland in a flame. Every effort was used to discover, or rather to obtain legal evidence against, the author, whom, Walpole was assured, it would then have taken 10,000 men to apprehend. None could be procured; the public passion swept everything before it; the patent was canceled; Wood was compensated by a pension; Swift was raised to a height of popularity which he retained for the rest of his life; and the only real sufferers were the Irish people, who lost a convenience so badly needed that they might well have afforded to connive at Wood's illicit profits. Perhaps, however, it was worth while to teach the English ministry that not everything could be done in Ireland. Swift's pamphlets, written in a style more level with the popular intelligence than even his own ordinary manner, are models alike to the controversialist who aids a good cause and to him who is burdened with a bad one. The former may profit by the study of his marvelous lucidity and vehemence, the latter by his sublime audacity in exaggeration and the sophistry with which he involves the innocent halfpence in the obloquy of the nefarious patentee.

The noise of the Drapier's letters had hardly died away when Swift acquired a more durable glory by the publication of *Gulliver's Travels* in 1726. The work had been at least partly written by 1722, and the keenness of the satire on courts and statesmen suggests that it was planned while Swift's disappointments as a public man were still rankling and recent.

Swift's grave humor and power of enforcing momentous truth by ludicrous exaggeration were next displayed in his *Modest Proposal for Preventing the Children of Poor People in Ireland from Being a Burden to their Parents,* by fattening and eating them (1729), a parallel to the *Argument Against Abolishing Christianity,* and as great a masterpiece of tragic as the latter is of comic irony. The *Directions to Servants* in like manner derive their overpowering comic force from the imperturbable solemnity with which all the misdemeanors that domestics can commit are enjoined upon them as duties. The power of minute observation displayed is most remarkable, as also in *Polite Conversation* (written in 1731, published in 1738), a surprising assemblage of the vulgarities and trivialities current in ordinary talk. It was a last flash of gayety. The attacks of giddiness and deafness to which he had always been liable increased upon him, and his literary compositions became confined to occasional verses, not seldom indecent and commonly trivial, with the exception of his remarkable lines on his own death and the delightful *Hamilton's Bawn,* and to sallies against the Irish bishops, in whose honest endeavors to raise the general standard of their clergy he could only see arbitrary interference with individuals.

In March, 1742, it was necessary to appoint guardians of Swift's person and estate. In September of the same year his physical malady reached a crisis, from which he emerged a helpless wreck, with faculties paralyzed rather than destroyed. The scene closed on October 19, 1745. With what he himself described as a satiric touch, his fortune was bequeathed to found a hospital for idiots and lunatics. He was interred in his cathedral, in the same coffin as Stella, with the epitaph, written by himself, "Hic depositum est corpus Jonathan Swift, S.T.P., hujus ecclesiæ cathedralis decani; ubi sæva indignatio ulterius cor lacerare nequit. Abi viator, et imitare, si poteris, strenuum pro virili libertatis vindicem."

SWIMMING AND DIVING. In the case of man the power of swimming is acquired, not natural. As compared with the lower animals, to most of which it comes perfectly easily, he is at a disadvantage in its acquisition, owing not to his greater relative weight so much as to the position of his center of gravity, along with the fact that in the case of quadrupeds the motions which serve to support and propel them in the water are very similar to those of locomotion on land. No race of mankind, however, can be mentioned to which the art is unknown, and in many barbarous countries it is more widely diffused and carried to greater perfection than among the civilized nations of the world.

For learning to swim, a quiet sandy beach is the best place, as sea water is more buoyant than fresh. All artificial aids, such as corks, air belts, cork jackets, inflated bladders, and the like, may be avoided; they raise some parts of the body too high above and so sink others too far below the natural plane of flotation, whereas the first fundamental rule is that the mouth only should be above water, and the legs close to the surface. Belts, etc., are also apt to become misplaced and so cause trouble and annoyance as well as danger. It is best for beginners to take some instruction from a practical teacher, though many have become adepts by merely watching good performers. Confidence in the floating power of the body is the first thing to be acquired. The easiest way of floating is to lie on the back (which should be slightly hollowed), the arms being stretched out beyond the head but not lifted out of the water; this attitude not only facilitates respiration but counterbalances the weight of the lower limbs. The knees may be bent outward, the toes also pointing sideways, the hips rigid, so assisting to keep the legs up as close as possible to the top of the water. By easy breathing one will soon be convinced that, properly balanced and with lungs kept charged, the body will assert its buoyancy. The novice should commence with the *Breast Stroke,* which is nowadays sometimes unjustly set aside as the "old stroke."

The stroke is commenced by placing the hands with the backs upward, and the wrists bent so that the fingers will point to the front, the inside of the wrist-joints between arm and thumbs touching the breast not lower than four inches under water. Begin the stroke by pushing the arms gently forward to their full extent, keeping the palms flat and the fingers closed. Now turn the palms of both hands outward, and make a strong stroke to the right and left by each arm through an angle of 90°; in this part of the stroke the two arms describe a semicircle, of which the head may be termed the center. It must be most distinctly borne in mind that all depression of the hands will tend to raise the body perpendicularly, whereas the only true position in swimming is the horizontal, which propels it forward. To complete the arm movement, bend the elbows backward and inward, until they come close to (but not necessarily touching) the sides of the body. Carry the hands in a straight line edgeways to the position from which they started in front of the chest. Simultaneously with the stretching of the hands from the front of the body the feet are struck out to the utmost width in a way cleft for them by the toes. As the arms are being brought round in the semicircular motion the lower limbs are stiffened and brought firmly together by grasping the water, so to speak, with the whole of the leg, more especially between the knees, ankles, and soles and toes of the feet. While thus imparting forward motion to the swimmer, they finish in a straight line behind the body. Then, when the arms are bent, and the hands are being brought to the front of the body, the knees are turned outward, heels kept together, toes also turned out, and the feet are carried up to the body and in this position are once more ready for repeating the movements as described. Beginners must be careful not to make the arm movements quicker than those of the legs, and it must be distinctly remembered that the latter are the great propellers. Unison of the movements as mentioned, and regularity in each part of the stroke, are indispensable to perfection. All hurry and excitement must be carefully avoided, and every complete stroke and kick gone about with mechanical precision and neatness. The only part requiring strong muscular exertion being the closing of the legs after they have been spread wide apart—the one strong propelling element—every effort is to be made to insure correctness and power in its performance. The arm movements should be easy and graceful, all jerkiness or suddenness of motion being carefully avoided.

Breathing should be unrestrained and natural, without gasping, sputtering, or short or sudden heavings. A safe rule is to have a full breath at every stroke, its division being regulated as follows. Blow slowly outward when the first part of the arm movement is being performed, *i.e.,* stretched out in front; inspire as the hands are going outward and round. Then, as the lungs are fully charged, no effort is necessary to suspend respiration while the hands are carried in to the front of the body again. This regularity of breathing is essential to pleasure, comfort, and gracefulness of action. The nostrils and air-passages should always be thoroughly cleared, the mouth cleansed, and the throat gargled before entering the water.

Swimming on the Back is a pleasant and useful branch of the art; the chief requisite for its acquirement is confidence. The tyro should begin practice in water reaching up to about the upper part of the chest.

turn his back shoreward, take a long breath, and lie gently backward in the water, keeping the hands on the waist with the elbows extended outward, the chest being expanded, and the breath held. As one lies well back the feet will be lifted off the ground; they should then be spread outward as far apart as possible, in the same position as when they are opened up in breast swimming. The body and legs are thus lying extended at full length like the letter Y, the legs forming the branches or fork. Now comes the propelling part of the movement. As in the front stroke, the muscles are set, and the legs are by one strong motion brought firmly and closely together. While this is being done the toes, by a slight movement of the ankle, are turned upward, and so, as the movement is finished, the great toes, inner ankles, and inside of the whole leg meet. This motion, strongly but not jerkily executed, sends the body forward, and, when the impetus obtained is nearly—not quite—expanded, the legs are bent, so that the feet are drawn close up to the trunk, with the knees outward and heels together. The stroke is renewed by spreading apart, closing again, and so on. The breath is exhaled when spreading and closing the legs, and inhaled as the feet are drawn up to the body. If greater speed is wanted, the hands can be used as sculls by carrying them outward from the body, but at the same time level with it, palms facing downward. When the arms are sufficiently extended to be in a line across from hand to hand, the wrists are turned to allow of the palms of the hands facing toward the feet, thumbs upward. Elbows, wrists and hands are now firmly braced, and a strong pull toward the legs is made. This is the progressive motion, and should be performed just as the legs are being closed.

Of *treading* as a branch of swimming something should be known by every one. It is the only department of the art that is at all natural; and, if treading were resorted to in cases of accidental immersion, three-fourths of the resulting deaths would be prevented. The essential condition, of course, is that the hands be kept under water. When one falls into water the legs sink and the body assumes a perpendicular position, the water splashes over the face, and, once the eyes become filled or the mouth covered, the inclination of any one unable to swim is to throw the hands up and make an effort as if to creep along on the surface. These efforts only increase the danger of the position. On becoming submerged one should keep perfectly inactive for a brief time; the head will soon rise above the surface, and at this moment one ought to beat downward with both hands alternately, never allowing them to splash or disturb the surface, the head being leaned back so as to keep only the face and nostrils clear. The back of the head and ears may be covered, but this does not matter. The motions of the hands, exactly similar to those of a dog's forepaws when swimming and walking, are to be continued, the feet at the same time striking down—not hurriedly, nor with sudden jerky movement, but easily and gracefully, the ankles moving as if working treadles, so that the soles of the feet act as sustaining and, it may be, propelling surfaces. The movements of hands and feet may be altered by beating downward with both hands at once, or both feet at once, but in cases of accident the former action is to be recommended.

The *Side Stroke* may be said to hold in swimming a position somewhat similar to that of running in pedestrianism; as it becomes better known, the advantages of this style of aquatic progression are becoming more and more appreciated. The body is turned on either side, but preferably with the right side downward, as thereby the legs act more freely and naturally and the heart has no weight on it to impede its action. The head is more immersed and thereby reduced in weight, being supported by the water and not by any muscular exertion of the neck or shoulder, and the lower extremities are less immersed than in the breast stroke. If one is lying on the right side, the right arm is thrown boldly out in front, with the palm of the hand downward and on a level with the lower side of the head. When pushed out to the utmost it is kept rigid, brought downward through the water in one strong movement, without any bending of either wrist or elbow, and this, the positive action, is finished when the hand has reached the legs, and comes between these limbs at full stretch. It is then carried up along the body to the chin, and the stroke renewed. The left hand is formed into a scoop, turned outward by the wrist at right angles to the forearm. The left arm, with the elbow bent, is then directed outward, and makes a straight pulling (not circular nor swinging) stroke to the left hip. When one arm is performing the negative the other is at the positive part of the stroke. The action of the legs should be long and vigorous, and they should never cross each other, but should work in unison with the arms and shoulders. The left knee is brought up in front of the body, with the foot in front of and at right angles to the body. Put the foot in a line with the front of the leg, and bring it round to meet the other in a line with the body. Meanwhile stretch the right or lower leg as far away as possible from the body toward the back and then bring it down to meet the other by a powerful plain stroke. The legs are then returned upward to the body, the heels touching, the knees apart, the toes of the left foot forward and of the right foot downward.

The *Overhand Stroke*, when properly practiced and acquired, is the most useful and easy of all styles of swimming. The only movements of the side stroke which differ from those of the overhand are those of the left or upper arm and hand. By carrying this arm in the air a lengthened reach is obtained above the surface. As in the side stroke, the head lies as far as possible into the water, the body, legs, and feet in a straight line level with and close to the surface. The left arm is carried forward and stretched as far as possible out of the water in a line with the face and in advance of the head. The arm and hand re-enter the water, and are pulled through it with the strongest propelling stroke. The limb out of water should be carried through the air quietly, gracefully, and evenly till dipped for the stroke, not swung uselessly round from the shoulder in a half circle. The left arm and hand being in the air, the head lies deeper in the water than in the side stroke, and it is reduced in weight. The legs work simultaneously with the left arm; that is, they are drawn up as this arm reaches in front, and are at their nearest wide stretch by the time it is in position for the pull; they are then pulled strongly together as the upper arm is performing its strong movement. At no time when the upper arm is being carried forward above the water should the hand be higher than a very few (say about three) inches above the surface. The elbow alone is elevated, and is the highest part of the arm. In fact, the hand is so close to the surface that, on being lifted upward after the delivery of the stroke, the wrist has to be bent; otherwise the fingers would actually touch the water. Once, however, the hand comes opposite the eyes it is straightened in a line with the fore-arm and in this position carried to the dipping point. Breathing is regulated in precisely the same way as when swimming by means of the side stroke.

SWINDON. The towns of Old and New Swindon, in Wiltshire, England, are situated on several railway lines, about seventy-seven miles west of London and thirty east-northeast of Bath. The old town is built on an eminence commanding fine views of the surrounding country. Swindon New Town, to the north from Old Swindon, has grown up since the construction of the Great Western railway, which has its principal works there. There is a market-house for meat, fish, and vegetables. Connected with the Great Western railway mechanics' institution there is a library of about 14,000 volumes. The combined areas of Old and New Swindon, which form separate urban sanitary districts, amount to 2,524 acres, with a population, in 1881, of 22,374. Old Swindon (area 1,214 acres) had a population, in 1871, of 4,092, and in 1881 of 4,696, and New Swindon (area 1,310 acres) a population in 1881 of 17,678.

SWINE. The oldest known even-toed or Artiodactyle Ungulates (see MAMMALIA) were neither Oxen, Antelopes, Deer, Camels, nor Pigs, but presented a generalized type, which by modification in various directions has given rise to all these very diverse forms. They were mostly of small size, and had invariably the full number of teeth of the typical mammalian heterodont dentition, viz., forty-four, of which the incisors were $\frac{3}{3}$ on each side, the canines $\frac{1}{1}$, the premolars $\frac{4}{4}$, and the true molars $\frac{3}{3}$. The molars were short and square, crowned with blunt, rounded cusps, and the canines were not remarkably developed. All the feet terminated in four toes, the two middle ones (the third and fourth of the complete typical mammalian extremity) of nearly equal size, the outer ones (second and fifth) smaller, and also equal. The five-toed ancestor of these forms has not yet been discovered. They had no special weapons, as horns or antlers, on their foreheads. Such was the condition of all the hitherto discovered animals of this division at the commencement of the Tertiary period. Very early a change took place in the characteristics of the molar teeth in certain members of the group; the rounded tubercles became sharp ridges curved in a crescentic form, and better adapted for a purely herbivorous diet, especially for cutting and bruising the comparatively dry and hard blades of grass which grow in open plains. The animals thus separated from the rest—the Selenodont (crescent-toothed) Artiodactyles—have undergone various further modifications of teeth, feet, and other parts, and constitute the diverse forms of ruminating animals mentioned above. Those whose molar teeth retained more of the primitive tuberculated (bunodont) form, were the ancestors of the present family of Swine, some of which, looking upon their organization as a whole, have undergone less change since the Eocene period than almost any other mammals.

The existing swine-like animals may be divided naturally into three families:—I. *Hippopotamidæ;* II. *Suidæ*, or true Pigs; III. *Dicotylidæ*, or Peccaries.

FAMILY HIPPOPOTAMIDÆ.—*Muzzle very broad and rounded. Feet short and broad, with four subequal toes, with short rounded hoofs, all reaching the ground in walking. Incisors not rooted but continuously growing; those of the upper jaw curved and directed downward; those of the lower straight and procumbent. Canines very large, curved, continuously growing; upper ones directed downward. Premolars* $\frac{4}{4}$; *molars* $\frac{3}{3}$. *Stomach complex. No cæcum.*

This appears to be an exclusively Old-World form—no animals belonging to it, either recent or fossil, having been found in America. The family has been divided into three genera, according to the number of the incisor teeth. (1) *Hexaprotodon,* incisors $\frac{3}{3}$, a type which comes nearest to the generalized or ancestral form of the group, is now extinct, being only known from the early Pliocene formations of the Sub-Himalayan range. (2) *Hippopotamus* proper, incisors $\frac{2}{2}$, contains the one well known species *H. amphibius*, now confined to the rivers and lakes of Africa, but formerly (in the Pliocene period) abundantly distributed, under various minor modifications, in Europe, as far north as England. Remains of an allied form have been found in the island of Madagascar, where it is now extinct. (3) *Chœropsis*, incisors reduced to $\frac{2}{1}$, contains one very small and still little known species, from rivers of Liberia, West Africa, *C. liberiensis.* (See HIPPOPOTAMUS.)

FAMILY SUIDÆ.—*An elongated mobile snout, with an expanded, truncated, nearly naked, flat, oval terminal surface in which the nostrils are placed. Feet narrow; four completely developed toes on each. Hoofs of the two middle toes with their contiguous surfaces flattened. The outer* (*second and fifth*) *digits not reaching to the ground in the ordinary walking position. Teeth variable in number, owing to the suppression in some forms of an upper incisor and one or more premolars. Incisors rooted. Upper canines curving more or less outward or upward. Stomach simple, except for a more or less developed pouch near the cardiac orifice. A cæcum. Colon spirally coiled. Confined to the Old World.*

Sus.—Dentition: $i\,\frac{3}{3}$, $c\,\frac{1}{1}$, $p\,\frac{4}{4}$, $m\,\frac{3}{3}$: total 44. Upper incisors diminishing rapidly in size from the first to the third. Lower incisors long, narrow, closely approximated, and almost horizontal in position, their apices inclining toward the middle line; the second slightly larger than the first, the third much smaller. Canines appear externally to the mouth as tusks, the form of the upper lip being modified to allow of their protrusion, but are much less developed in the females than in the males. The teeth of the molar series gradually increase in size and complexity from first to last, and are arranged in contiguous series, except that the first lower premolar is separated by an interval from the second. First and second upper premolars with compressed crowns and two roots. The third and fourth have an inner lobe developed on the crown, and an additional pair of roots. The first and second true molars have quadrate crowns, with four principal obtuse conical cusps, around which numerous accessory cusps are clustered. The crown of the third molar is nearly as long (antero-posteriorly) as those of the first and second together, having, in addition to the four principal lobes, a large posterior talon or heel, composed of numerous clustered conical cusps, and supported by several additional roots. The lower molar teeth resemble generally those of the upper jaw, but are narrower.

This genus occurs at present under three principal modifications or subgenera.

A. *Sus* proper comprises a number of animals found in a wild state throughout the greater part of Europe (except where exterminated by human agency), the north of Africa, southern continental Asia, and the great islands of the Malayan archipelago, Formosa, and Japan. This list will give some idea of the geographical distribution of wild pigs, but it must be borne in mind that through the whole of this region, and in fact now throughout the greater part of the habitable world, pigs are kept by man in a domesticated state, and it is still an open question whether some of the wild pigs of the islands named above may not be local races derived originally from imported domestic specimens. Whether the various breeds of domestic pigs have been derived from one or several sources is still unknown. It is, however, tolerably certain that all the species or forms of wild pigs enumerated and all the domestic races are closely allied, and it is probable (though of this there has been no opportunity of proof) will breed freely together. It is a curious circumstance that the young of all the wild kinds of pigs (as far as is known at present) present a uniform coloration, being dark brown with longitudinal stripes of a paler color, a character which completely disappears after the first few months. On the other hand, this peculiar marking is rarely seen in domestic pigs in any part of the world, although it has been occasionally observed.

B. The diminutive pig of Nepal, the Terai, and Bhutan, *Sus salvanius*, has been separated from the rest by Hodgson under the generic name of *Porcula*, but all the alleged distinctive characteristics prove on more careful investigation to have little real value.

C. Two well-marked species of African swine have been with more reason separated under the name of *Potamochœrus*. The detention differs from that of true *Sus*, inasmuch as the anterior premolars have a tendency to disappear. The molar teeth are also less complex; the last especially has a much less developed heel. There are also characteristic cranial differences. The two species are very distinct in outward appearance and coloration. One is P. *africanus*, the South African River-Hog, or Bosch-Vark, of a gray color, and the other *P. porcus* or *penicillatus*, the West African Red River-Hog, remarkable for its vivid coloring and long penciled ears.

Babirussæ.—Dentition: $i\,\frac{2}{3}$, $c\,\frac{1}{1}$, $p\,\frac{2}{2}$, $m\,\frac{3}{3}$; total 34. The total number of teeth is therefore considerably reduced, the outer upper incisor and the two anterior premolars of both jaws being absent. The molars, especially the last, are smaller and simpler than in *Sus*, but the great peculiarity of this genus is the extraordinary development of the canines of the male. There is but one species, *B. alfurus*, found only in the islands of Celebes and Buru. Its external surface is almost entirely devoid of hair.

Phacochœrus.—The Wart-Hogs, so called from the large cutaneous lobes projecting from each side of the face, have the teeth still more remarkably modified than in *Babirussa*. The milk dentition, and even the early condition of the permanent dentition, is formed on the same general type as that of *Sus*, except that certain of the typical teeth are absent, the formula being $i\,\frac{1}{3}$, $c\,\frac{1}{1}$, $p\,\frac{3}{2}$, $m\,\frac{3}{3}$, total 34; but as age advances all the teeth have a tendency to disappear, except the canines and the posterior molars, but these, which in some cases are the only teeth left in the jaws, attain an extraordinary development. The upper canines especially are of great size, and curve outward, forward, and upward. The lower canines are much more slender, but follow the same curve; except on the posterior surface, their crowns are covered with enamel. Unlike those of the babirussa, the canines of the wart-hog are large in both sexes.

Two species of this genus are distinguished:—*P. africanus*, Ælian's Wart-Hog, widely distributed over the continent; and *P. æthiopicus*, Pallas' Wart-Hog, confined to southeastern Africa. In the latter species the dentition reaches its most complete reduction, as in adult specimens the upper incisors are absent and the lower ones worn down to the roots.

FAMILY DICOTYLIDÆ. *Snout as in* Suidæ. *Dentition:* i $\frac{2}{3}$, c $\frac{1}{1}$, p $\frac{3}{3}$, m $\frac{3}{3}$; *total* 38. *Incisors rooted; upper canines directed downward, with sharp cutting hinder edges. Toes, four on the fore feet and three on the hind feet* (*the fifth wanting*). *Stomach complex. A cæcum. Confined to the New World.*

There is one genus, *Dicotyles*, with two species, *D. tagaçu*, the Collared Peccary, and *D. labiatus*, the White-Lipped Peccary. See PECCARY.

SWINEMÜNDE, a Baltic port and bathing-place on the island of Usedom in Pomerania, Prussia, is situated at the mouth of the Swine, thirty-five miles to the northwest of Stettin. The entrance to the harbor, one of the best on the Prussian Baltic coast, is protected by two long breakwaters, and is strongly fortified. Swinemünde lighthouse, 216 feet high, the loftiest in Germany, rises beside the new docks on the island of Wollin, on the other side of the narrow Swine. Ships drawing not more than sixteen feet can proceed to Stettin, but those of heavier burden discharge or lighten at Swinemünde, which thus stands in the relation of a fore-port to the larger city, with which it is connected by railway. Exclusive of merely passing ships, 615 vessels with a burden of 189,491 tons entered and 607 vessels with a burden of 179,336 tons cleared the port in 1880. In 1882 it possessed a fleet of thirty-nine vessels with a burden of 5,218 tons. The population in 1880 was 8,478.

SWINTON, a town in the West Riding of Yorkshire, is situated at the junction of the Dearne and Dove navigation with the river Don navigation, and of the South Yorkshire and Midland railway lines, nine miles northeast of Sheffield and eight southwest of Doncaster. There are collieries, quarries and brickfields in the neighborhood. A large number of persons are employed in the South Yorkshire railway establishment for the repairing of engines and wagons. There are also flint and glass-bottle works, iron-works (for stoves, grates, fenders, and kitchen ranges), and earthenware manufactures. The town was formerly renowned for its Rockingham ware, but the manufacture has been discontinued for some years. The population of the urban sanitary district (area 1,700 acres) in 1871 was 5,150, and in 1881 it was 7,612.

SWINTON, a large village of Lancashire, is situated on several railway lines, five miles northwest of Manchester and six southeast of Bolton. The manufacture of cotton and coal mining are the chief industries. Anciently a large part of Swinton was possessed by the Knights Hospitalers of St. John of Jerusalem. Swinton and Pendlebury form an urban sanitary district (area 2,166 acres) under the government of a local board of twelve members; its population, estimated at 14,052 for 1871, amounted in 1881 to 18,107.

SWITHUN, ST., bishop of Winchester from 852 to 862. The name of St. Swithun, patron saint of Winchester cathedral from the tenth to the sixteenth century, is scarcely to be found in any contemporary document. His death is entered in the *Anglo-Saxon Chronicle* under the year 861; and his signature is appended to several charters in Kemble's *Codex Diplomaticus*. Of these charters three belong to 833, 838, and some year between 860 and 862. In the first the saint signs as "Swithunus presbyter regis Egberti," in the second as "Swithunus diaconus," and in the third as "Swithunus episcopus." Hence if the second charter be genuine the first must be spurious, and is so marked in Kemble.

More than a hundred years later, when Dunstan and Ethelwold of Winchester were inaugurating their church reform and supplanting the secular canons of the degenerate English foundations by monks, St. Swithun was adopted as patron of the restored church at Winchester, formerly dedicated to St. Peter and St. Paul. His body was taken up from its almost forgotten grave outside the old monastery and transplanted to Ethelwold's new basilica on July 15, 971. Numerous miracles preceded and followed this translation. "We have seen," says one contemporary writer, "the precincts of the monastery so thronged with crowds of ailing folk that a traveler could scarcely make his way to the shrine; and yet, after some days, so numerous were the cures that even within the church itself there were scarcely five sick people to be seen." Another writer, likewise a contemporary, claims to the saint's credit two hundred cures in the short space of ten days.

SWITZERLAND. As the Swiss Confederation consists of a number of small districts, differing from each other in many points, but gathered round a common center, originally for common defense against a common foe, it is not surprising that its political boundaries do not coincide with those of nature. So we find that Ticino is south of the main chain of the Alps, a large part of the Grisons is east of the Rhine and of the ranges separating it from Tyrol, while Schaffhausen is north of the Rhine, and Porrentruy is in the French plain far down the western slope of the Jura.

Omitting special cases, we may roughly describe Switzerland as consisting of two great trenches traversed by two great rivers, and inclosed by two huge mountain masses, together with the enormous valley of the Aar and the smaller one of the Thur, both these shut in by the great north outlier of the main chain of the Alps, the Rhine, and the Jura—two deeply cut trenches, and two wide and undulating valleys. The main chain of the Alps rises in Swiss territory to the height of 15,217 feet in Monte Rosa, and its north outlier to 14,026 feet in the Finsteraarhorn. The mean level of the Aar valley has been estimated at 1,378 feet, its lowest point being the low-water mark of the Rhine at Basel (914 feet); the lowest level within the Confederation, however, is on the Lago Maggiore (646 feet).

The total area of Switzerland (15,981 square miles) is distributed over four great river basins (draining to three different seas):—Rhine, Rhone, Po, and Inn. The *Rhine* basin is by far the largest in Switzerland, and drains of course to the North Sea. The Rhine itself is formed of two branches—Vorder Rhine (Valley of Dissentis) and Hinter Rhine (from the Splugen and St. Bernardino)—which unite at Reichenau, near Chur. The joint stream receives several mountain torrents, expands into the Lake of Constance, and then turns west, receiving the Thur, and opposite Waldshut the great stream of the Aar, finally leaving Swiss territory at Basel, where it turns north. Its main affluent is the Aar, the basin of which covers no less than 6,794 square miles. This stream rises in the glaciers of the Bernese Oberland, expands into the Lakes of Brienz and of Thun, receives from the left the Kander, the Saane, and the Zihl, and from the right the Emme, as well as (near Brugg, that great meeting place of the waters) the Reuss flowing through the Lake of Lucerne and the united stream of the Linth and the Limmat flowing through the Lakes of Wallenstadt and Zurich. The *Rhone* rises in the glacier of the same name and flows west, receiving the mountain torrents of the Visp, the Lonza, and the Dranse, besides others, expands into the Lake of Geneva, and a little way from Geneva quits Swiss territory on its way to the Mediterranean. The main stream flowing from Switzerland to the *Po* basin is the Ticino (from the St. Gotthard), which widens into the Lago Maggiore; another stream expands into the Lake of Lugano; and others run into the Lake of Como—all finally joining the Po in the Lombard plains, thus draining to the Adriatic. The Ramm, flowing through the Münsterthal, joins the Adige and so drains into the Adriatic. The *Inn* basin is composed of the upper part of the river (above Martinsbruck) and drains into the Danube and so into the Black Sea.

There are very many lakes in Switzerland. The two largest (Geneva and Constance) balance each other at the southwest and northeast corners of the Confederation.

There are a great number of waterfalls in Switzerland, the loftiest being that of the Staubbach (1,00 feet), in the valley of Lauterbrunnen, or "Cle Springs" (Bernese Oberland). In the Oberland, too, we find the Handeck (200–220 feet), near the source of the Aar, while the Reichenbach descends in seven falls and the Giessbach in thirteen. The falls of the Rhine at Schaffhausen contain an enormous mass of water, though they are only eighty-two feet in height. In southern Switzerland the Pissevache fall (200 feet), in the Rhone valley, is the best known. The distribution of the Swiss glaciers deserves notice, for in eleven cantons (that is, half of those in the Confederation) there are no glaciers at all, while in five others (Unterwalden, Vaud, St. Gall, Schwyz, and Appenzell) they only cover about thirteen square miles out of 709.9 square miles of ice and snow in the Confederation, according to the official survey. Valais heads the list with 375.1 square miles, then come the Grisons (138.6), Bern (111.3), Uri (44.3), Glarus (13.9), and Ticino (13.1). The longest glacier in the Alps is the Gross Aletsch in the Bernese Oberland, fifteen miles long; it has a basin of 49.8 square miles and a maximum breadth of 1,968 yards. In point of length the Unteraar glacier comes next (10.4 miles), followed by the Gorner and Viescher glaciers (each 9.4 miles). The lowest point to which a Swiss glacier is known to have descended is 3,225 feet, attained by the Lower Grindelwald glacier in 1818. Doctor Heim has ascertained that the maximum annual snowfall in the Alps takes place in the lower snow regions, a conclusion which the present writer can confirm from personal experience gained on the ascent of several of the highest Oberland peaks in January, 1874 and 1879. Doctor Heim states that in the central Alps of Switzerland the limit of perpetual snow varies from 9,259 to 9,023 feet. See GLACIER.

In Switzerland, where the height above sea level varies from 646 feet (Lago Maggiore) to 15,217 feet (Monte Rosa), we naturally find very many climates, from the regions of olives, vines, oaks and beeches, pines and firs, to those of high mountain pastures, rhododendrons, and of eternal snows (see ALPS). As regards the duration of the seasons, there is a corresponding variety. It has been reckoned that, while in Italian Switzerland winter lasts only three months, at Glarus it lasts four, in the Engadine six, on the St. Gotthard eight, on the Great St. Bernard nine, and on the St. Théodule always. The Alps form the boundary between the region where the rainfall is greatest in summer and that where it is greatest in autumn, the winter and spring rainfall varying but slightly. It has been shown by careful observations that the rain (or snow) fall is greatest as we approach the Alps, whether from the north or south, the flanks of the great ranges and the valleys opening out toward the plains receiving much more rain than the high Alpine valleys inclosed on all sides by lofty ridges. Thus the annual rainfall is 35 inches at Basel, but 64½ at Beatenberg (above Interlaken), and 69 at Schwyz, rising to 88 on the Grimsel and 102 on the St. Bernardino, and falling again at Lugano to 63. Doctor Heim calculates that the percentage of snow in the total annual rainfall in Switzerland varies from 63 on the Great St. Bernard to 6 at Geneva, the mean fall of 34 being at Platta in the Grisons. Thunderstorms generally vary in frequency with the amount of rainfall, being most common near the great ranges, and often very local.

As regards the larger cyclones or storms of Europe, a south wind in the Alps indicates that the barometrical minimum is in the English Channel, a west wind that it is in the North Sea, a north wind that it is in the Eastern Alps, and an east wind that the depression is in the Mediterranean, about Corsica. When the barometrical minimum shifts from the Atlantic over Scandinavia to Russia, a southwest wind in the Alps is followed by west and then north winds. The "fohn" is the most remarkable of the local winds in Switzerland—a strong southwest or south wind, very hot and very dry.

Switzerland has many varieties of climate; and while, owing to the distribution of the rainfall, the Ticino and Aar valleys are very fertile, the two great trenches between the main chain and its north outlier, though warm, are less productive, as the water comes from the rivers and not from the skies.

Asphalt is the only raw mineral product the export of which exceeds the import; and it is obtained only in the canton of Neuchâtel, where the output of the Val de Travers deposit in 1883 reached 28,000 tons. Though iron ores are known (according to Weber and Brosi's map) to exist in thirteen localities, gold in three, silver in twenty-two, copper in twenty-nine, lead in twenty-seven, nickel and cobalt in two, tin in one, sulphur in three, Switzerland is practically dependent for all its metals on foreign supply. While 35,161 tons of iron were obtained in 1870 (mostly from mines in the Jura), only 19,045 were obtained in 1881. True coal is wholly absent; lignites, however, occur both in the Tertiary and the Quaternary formations, the most important workings being those of Käpfnach, Utznach, Mörschwyl, Dürnten, Lutry, Conversion, and Oron. In 1870 the output was 33,364 tons, in 1881 only 6,184. Anthracite occurs in Valais. Peat is common in many parts. Salt is procured from wells in Aargau, Basel, and Vaud. The first salt-deposit was discovered in 1836 at Rothenhaus (Basel canton), that of Rheinfelden in 1844, of Ryburg in 1845, and of Kaiseraugst in 1865. The wells at Bex have been worked since 1554. Game is not abundant in any part of Switzerland, and rigorous game laws and other devices have been adopted in order to increase the number of wild animals. In the Alpine regions the marmot and Alpine hare are still common, and their numbers have increased under the protective system. Grouse, partridge, wild duck, and snipe are the chief game birds. It is estimated that the fish-bearing waters in the whole country cover an aggregate area of 1,581 square kilometers (1,348 belonging to lakes and 233 to rivers and streams), the cantons with the greatest areas being Vaud (443 square kilometers), Bern (161), Thurgau (139), and Neuchâtel (98). Close seasons, and in certain places close years, have been established, and numerous fish-hatcheries are also in operation (57 in 1885), the species treated being mainly salmon, lake trout, river trout, grayling (ombre), red trout or Röthel, the Swiss *Coregonus*, American *Coregonus* (*C. albus*), *Salmo fontinalis*, and the "mäder." No fewer than 5,709,432 fish were introduced into the lakes and rivers in 1885. Great importance attaches to the domestic animals of Switzerland. The following are the numbers for 1876 and 1886: Horses, 100,935 and 98,333; cattle, 1,035,930, 1,211,713; sheep, 367,549, 341,632; goats, 396,055, 415,916; pigs, 334,515, 394,451; mules, 3,145, 2,741; asses, 2,113, 2,042; and beehives, 177,825, 207,180.

The first federal census of which the results were published was neither quite synchronous (April 1836 to February, 1838), nor quite systematic. That of 1850 took account only of the population with right of residence (*population domiciliée*), and not of the population actually present at the date of the census. In 1860 the census was declared decennial. The following are the numbers returned:—March 18–23, 1850, 2,392,740; December 10, 1860, 2,507,170; December 1, 1870, 2,669,147; December 1, 1880, 2,846,102. In 1888 the population was 2,926,750. The population is formed by three nationalities, distinct by their language, as German 71 per cent., French 21 per cent., Italian 6 per cent., and Romanshe (in the Grisons) 1½ per cent.

As regards density of population, Switzerland, with 198.5 persons to the square mile, stands considerably above Scotland (125) and a long way below England and Wales (446). The Alpine region is the sparsest generally, though certain districts, like Appenzell Ausser-Rhoden, are very densely peopled; the Jura region has a much higher ratio; and the densest region of all is the Swiss plateau.

In 1880 there were 960.8 males to every 1,000 females. For every 1,000 above the age of fifty there are 176 unmarried females to 154 unmarried males. The disproportion of the sexes in the country at large is mainly due to emigration; but in certain cantons it is partly due to excess of women in the immigrants from neighboring countries. In Uri, Schwyz, and Valais only is there an excess of males. The proportion of married persons to the total number of the adults (47.4 per cent.) is less than in most other countries, though this proportion has been gradually raised both before and since 1880 by certain legislative changes, including the new marriage law in 1874. At the same time the average fertility of the marriages has decreased. Divorce and separation are frequent.

Between 1868 and 1877 the average number of emigrants from Switzerland was 3,516 per annum; between 1878 and 1882 it was 7,196. In 1883, 1884, and 1885 the figures were respectively 13,502 (12,758 of them native-born Swiss), 9,608, and 7,583. By far the greater proportion of the emigrants found their way to America, and mainly to the United States, though some of the South American republics (as Chili) attract a considerable number. In the five years 1876–80 3,172 persons on an average left for North America annually, 99 for Central America, 594 for South America, and 107 for Australia, while Asia and Africa together did not count more than 167. The population is to a very great extent rural. Only three cities (Zurich, Geneva, and Basel) have a population exceeding 50,000, and at the census of 1880 only 59 other towns had each more than 4,000 inhabitants. Of these Bern, Lausanne, Chaux de Fonds (22,456), St. Gall, Lucerne, Neuchâtel, Winterthur (13,595), Schaffhausen, Biel (11,623), Freiburg, Herisau (11,082), and Locle (10,464) exceeded 10,000.

It has been estimated that, of the whole area of Switzerland, 1,642,471 acres are under arable cultivation and 1,917,632 acres in forest, while 2,866,113 acres are altogether unproductive. Agricultural statistics have never been systematically registered by the federal authorities, and only a few of the cantons have devoted serious attention to the matter. The value of the fruit produce is given as $25,000,000.

The name "allmend" is given to land still held in common, whether arable, meadow, pasture, or forest. The pasture lands are most numerous in Neuchâtel, Bern, and Grisons. The capital value of the whole is estimated at $40,000,000 or more. Of the 3,032 miles of forest land 127.3 belong to the state, 2,007 1 to "communes" or private associations, and 897 to private persons. The federal government has done much to reafforest tracts, both by itself and by stimulating cantonal effort, and generally to promote the science of forestry. The silk industry of Switzerland was already established at Zurich and Basel in the latter half of the thirteenth century; but after a period of prosperity it died out. It was again introduced by the Protestants expelled from Locarno in 1555. Crape, velvet, and taffetas were the favorite products of the first stage; ribbon-weaving came later with another band of Locarno refugees and the French Huguenots. In 1877

116 firms were engaged in the silk trade, in 1881, 134. Between those dates the employés had increased from 39,940 to 49,816 (65,000 in 1883). In 1881 2,153,100 kilos of raw silk and 1,067,700 of silk-waste were imported; and the export of silk goods, ribbons, and ferret silk was 1,152,300, 1,965,400, and 819,000 kilos respectively. Cotton began to be manufactured in Switzerland in the fifteenth century, and power-loom weaving was introduced in 1830. The industry has owed a good deal to the abundant water-power of the country. The workers numbered 88,046 in 1883. Bleaching and cloth-dressing have attained a great development in the neighborhood of St. Gall, both in the cantons of St. Gall and Appenzell. Printworks are especially numerous in Glarus. Aargau is the chief seat of the woolen manufacture. Linen, the first of the Swiss textile fabrics to find its way to a foreign market, is no longer manufactured on a large scale. Embroidered goods are the great specialty of the export trade of eastern Switzerland—the cantons of St. Gall, Appenzell, Thurgau, and part of Zurich. The St. Gall market is also supplied by a large number of workers in Vorarlberg. The value of the embroidered goods exported from the consular district of St. Gall for America alone increased from $3,800,000 to nearly $6,000,000 between 1879 and 1882. Straw plaiting is an important industry in Aargau (center at Wohlen), Ticino, and Freiburg Watch and clock making is a specially Swiss industry, giving employment to 44,000 workers. The condensed-milk industry of Switzerland is also well known. Swiss cheese (Emmenthal and Gruyère) has a widespread reputation, the export increased from 5,093,100 kilos in 1851 to 25,959,400 in 1883. The production of beer in Switzerland was 6,160,000 gallons in 1867 and 20,240,000 in 1882; in the latter year 289,564 gallons were exported. The distilleries (1006) produce about 990,000 gallons of pure alcohol annually. Allusion can only be made here to the great chemical industries of the country, its potteries, paper-mills, engineering works, gun-factories, etc. Wood-carving was one of the most ancient, as it is now one of the best known, of the minor arts of Switzerland. The great seat of the modern industry is the Bernese Oberland, where the peasants during the long evenings of winter for centuries devoted themselves to producing artistic articles in wood. It was regularly organized by Christian Fischer in Brienz (1825), and is now mainly in the hands of a company, founded in 1881, which associates capitalists and workmen in the profits.

In Gsell-Fels' *Bäder u. klimatische Kurorte der Schweiz* 505 health stations are mentioned. In Aargau there are the hot springs of Baden and Schinznach (sulphur), the salt baths of Rheinfelden and Mumpf, the mineral waters of Wildegg and Birmensdorf. Basel contains salt baths at Schweizerhalle, Bienenberg, and Schauenburg. Bern is particularly rich in baths and sanatoriums. Schwarzseebad is the chief mineral spring in Freiburg; Pfäffers-Ragatz in St. Gall is world-famous. The Stachelberger Schwefelbad in Glarus is much frequented. The Grisons have almost a superfluity of mineral waters, some of which (St. Moritz, Fideris) are exported in large quantities. Weissenstein in Soleure is one of the oldest sanatoriums in Switzerland. Lavey and Bex in Vaud are respectively famous for their sulphur and salt baths. In Valais, Saxon and Leukerbad are famous.

The position taken by Switzerland in the trade and commerce of the world is remarkable when the various natural obstacles are considered—such as absence of raw material for her industries, costly and difficult means of transport, and restrictive customs established by neighboring countries. England is the great market for silver watches; Germany for gold watches and musical boxes; France for weaving machinery; Russia for mills; Italy for miscellaneous machinery; France for asphalt; France for butter; France, Italy, Germany, and the United States for cheese; Germany for silk; Germany for cattle; France for sheep and goats. Cotton manufactures find their way to France, Italy, Austria, Britain, Germany, Spain, India, etc.; leather to the United States and the Argentine Republic. In 1888 the imports from all countries amounted to $16,541,720, and the exports to $13,461,213.

By article 27 of the federal constitution of 1874, primary instruction, while left in the charge of the several cantons, is required to be sufficient, obligatory, gratuitous, unsectarian, and under public control of the state. The primary school age is up to twelve years, as far as this general law is concerned, but in some cantons this is raised to fourteen, fifteen, or sixteen years of age. The first school year also varies from five to seven in different cantons. Great variety indeed exists in the whole school organization of the several cantons; while the chief authority as regards the primary schools is in some cases vested in an educational department or educational council, or both, in others it is intrusted to an educational director with or without a council. Funds are provided by the state, the commune, and often by the private individual. Even in remote districts the school buildings are generally good. Bern has been especially active in building new schools. In 1889 218,191 boys and 215,889 girls attended the primary schools. Of these 311,271 had German as their mother tongue, 97,113 French, 19,864 Italian, and 5,832 Romanshe. The total number of male teachers was 5,840, and of female teachers 2,525; the average pay in money per male teacher was $261; for female teachers $161. The primary school property was valued at $27,506,915 ($17,329,501 in 1871). For the school children who are too poor to obtain proper food and clothing both public and private assistance is freely rendered. Besides the ordinary public primary schools, there are a considerable number of secondary schools (attended by 11,155 boys and 8,976 girls), preparatory (or intermediate) schools (9,556, 2,133), infant schools (10,864, 11.242), schools for adults (12,758, 1,110), and private schools (6,057, 4,834). In 1882 there were in all 272,039 males and 244,896 females in receipt of education. Among the preparatory schools are the "colleges" or "gymnasiums" and the industrial schools, one of which exists in almost all the cantonal capitals as well as at Winterthur, Burgdorf, Porrentruy, Einsiedeln, Murten, and Brieg. In Grisons and Neuchâtel normal schools for the education of teachers are attached to the cantonal schools. Separate establishments for this purpose exist in the cantons of Zurich, Bern, Lucerne, Schwyz, Freiburg, Soleure, St. Gall, Aargau, Thurgau, Tessin, Vaud, and Valais. Among the more specialized institutions of the preparatory or middle class are the *Technitium* at Winterthur, the veterinary colleges at Zurich and Bern, the agricultural schools at Oberstrass and Rütli, and the school of dentistry at Geneva. In the four universities of Basel, Bern, Zurich, and Geneva, each with faculties of law, theology, medicine, and arts (philosophy), the average number of matriculated students per session of six months was, in theology 113, in law 188, in medicine 469, and in arts 288—a total of 1,058, to which must be added 334 non-matriculated. Basel has a preponderance in theology, Bern in law, Zurich in arts. The great federal polytechnicum at Zurich (opened in 1855) comprises schools of architecture, civil and industrial engineering, industrial chemistry, forestry, and agriculture.

The total revenue of the Confederation in 1888–89 was $11,978,575, and the total expenditures $11,711,040. The national debt, including $5,000,000 raised for national defense, in 1889 was $10,974,600.

In Switzerland there is no standing army, but every male citizen between twenty-four and forty-four years of age is bound to military service and drill. The federal forces consist of the *Auszug*, *Élite*, or regular army (men from twenty to thirty-two years old), and the landwehr (men thirty-two to forty-four years). The whole army was reorganized in 1874, when extensive functions were assigned to the military physician in connection with the recruiting and calling out of the soldiers. In 1889 the regulars, including the landwehr, numbered 206,285 men.

Railway construction, which began in 1844, proceeded in earnest after the new legislation of 1852, and by the close of 1862 718 miles had been constructed; by 1872 the ordinary lines reached a total of 1,459 miles, with 5 miles of special lines; for 1882 the corresponding figures were 2,667 and 81. Tramways began to be laid down in 1862, and rope railways in 1877. The railways are mostly in the northern plateau and connect with the systems of Northern Europe. The only Swiss line which crosses to the south of the Alps is the St. Gotthard (see RAILWAYS). The proposed Simplon railway has already been carried up the Rhone valley as far as Brieg. The mountainous character of the country and the special exigencies of its traffic have successfully stimulated to some striking efforts of railway engineering. Thus the Rigi railway rises from the Lake of Lucerne to a height of 5,739 feet, with a maximum gradient of 250 per thousand; that of the Rorschach-Heiden line is 50 per thousand. In 1889 there were 1,962 miles of railway and 4,418 miles of telegraph.

Switzerland is famous for its well-made and well-kept carriage-roads. Some of those that traverse the mountain-passes have been constructed at great expense.

Bern has been the seat of the international Postal Union since 1874. The federalization of the national post-office dates from 1848—the different cantons having previously conducted their postal business according to very different methods. It is to be noted that this department charges itself with the conveyance of passengers as well as mails—these numbering 831,839 in 1880 and 754,365 in 1885.

In Switzerland there are thirty-three legalized banks of issue; their average circulation of notes is of the value of $24,686,200. There are 325 savings banks proper (deposits $49,271,347), and 162 other institutions whose deposits are $53,459,709. Most of these are in the hands of companies or private merchants.

Swiss history falls naturally into five great divisions: I. the origin of the Confederation—up to 1291; II. the shaking off dependence on the Hapsburgs—up to 1394 (1474); III. the shaking off dependence on the empire—up to 1499 (1648); IV. the period of religious divisions and French influence—up to 1814; V. the construction of an independent state as embodied in the constitutions of 1848 and 1874.

On August 1, 1291, the men of the valley of Uri, the free community of the valley of Schwyz, and the association of the men of the lower valley or Nidwald, formed an Everlasting League for the purpose of self-defense against all who should attack or trouble them, a league which is expressly stated to be a confirmation of a former one. This League was the foundation of the Swiss Confederation.

In the struggle for the empire, which extended over the years following the conclusion of the League of 1291, we find that the Confederates support without exception the anti-Hapsburg candidate. On October 16, 1291, Uri and Schwyz ally themselves with Zurich, and join the general rising in Swabia against Albert, the new head of the house of Hapsburg. It soon failed, but hopes revived when in 1292 Adolf of Nassau was chosen emperor. In 1297 he confirmed to the free men of Schwyz their charter of 1240, and, strangely enough, confirmed the same charter to Uri, instead of their own of 1231. But in 1298 Albert of Hapsburg himself was elected to the empire. His rule was strict and severe, though not oppressive. He did not indeed confirm the charters of Uri or of Schwyz, but he did not attack the ancient rights of the former, and in the latter he exercised his rights as a landowner, and did not abuse his political rights as emperor or as count. It was in his time too that the "terrier" (or list of manors and estates, with enumeration of all quit rents, dues, etc., payable by the tenants to their lords) of all the Hapsburg possessions in Upper Germany was begun, and it was on the point of being extended to Schwyz and Unterwalden when Albert was murdered (1308) and the election of Henry of Luxemburg roused the free men to resist the officials charged with the survey.

On Henry's death, in 1313, the electors hesitated long between Frederick the Handsome of Hapsburg, and Louis of Bavaria. The men of Schwyz seized this opportunity for making a wanton attack on the great abbey of Einsiedeln, with which they had a long standing quarrel as to rights of pasture. The abbot caused them to be excommunicated, and Frederick (the choice of the minority of the electors), who was the hereditary "advocate" of the abbey, placed them under the ban of the empire. Louis, to whom they appealed, removed the ban; on which Frederick issued a decree by which he restored to his family all their rights and possessions in the three valleys and Urseren, and charged his brother Leopold with the execution of this order. Leopold collected a brilliant army at the Austrian town of Zug in order to attack Schwyz, while a body of troops was to take Unterwalden in the rear by way of the Brünig pass. On November 15, 1315, Leopold, with from 15,000 to 20,000 men, moved forward along the shore of the Lake of Egeri, intending to assail the village of Schwyz by climbing the steep hillside above the southern end of the lake, through the narrow pass of Morgarten, between the mountain and the lake. At the summit of the pass waited the valiant band of the Confederates, from 1,300 to 1,500 strong. The march up the rugged and slippery slope threw the Austrian army into disarray, which became a rout and mad flight. No fewer than 1,500 Austrians fell. Leopold fled in hot haste to Winterthur, and the attack by the Brünig was driven back by the men of Unterwalden. On December 9, 1315, representatives of the victorious highlanders met at Brunnen, on the Lake of Lucerne, not far from Schwyz, and renewed the Everlasting League of 1291. Louis solemnly recognized and confirmed the new League in 1316, and in 1318 a truce was concluded between the Confederates and the Hapsburgs, who treat with them on equal terms. The lands and rights annexed belonging to the Hapsburgs in the Forest districts are fully recognized as they existed in the days of Henry of Luxemburg, and freedom of commerce is granted. But there is not one word about the political rights of the Hapsburgs as counts of the Zürichgau and the Aargau.

As early as 1320 we find the name "Swiss" (derived from Schwyz, which had always been the leader in the struggle) applied to the Confederation as a whole, though it was not till after Sempach (1386) that it came into popular use, and it did not form the official name of the Confederation till 1803. First to join the League

(1332) was the neighboring town of Lucerne, which had grown up round the monastery of St. Leodegar. Next, in 1351, came the ancient city of Zurich, which in 1218, on the extinction of the house of Zäringen, had become a free imperial city in which the abbess of the Fraumünster (the lady of Uri) had great influence, though from 1240 the citizens elected the council which she had previously named. In this way the League now advanced from the hilly country to the plains, though the terms of the treaty with Zurich did not bind it so closely to the Confederates as in the other cases, and hence rendered it possible for Zurich now and again to incline toward Austria in a fashion which did great hurt to its allies. In 1352 the League was enlarged by the admission of Glarus and Zug. Three weeks later the town and district of Zug, attacked by the League and abandoned by their Hapsburg masters, joined the Confederation, forming a transition link between the civic and rural members of the League. The immediate occasion of the union of these two districts was the war begun by the Austrian duke against Zurich, which was ended by the Brandenburg peace of 1352, by which Glarus and Zug were to be restored to the Hapsburgs, who also regained their rights over Lucerne; Zug was won for good by a bold stroke of the men of Schwyz in 1364, but it was not till the day of Näfels (1388) that Glarus recovered its lost freedom. These temporary losses and the treaty made by Brun of Zurich with Austria in 1356 were, however, far outweighed by the entrance into the League in 1353 of the famous town of Bern. The special importance of the accession of Bern was that the League now began to spread to the west, and was thus brought into connection for the first time with the French-speaking land of Savoy. The League thus numbered eight members, and no further members were admitted till 1481, after the Burgundian war.

After a short interval of peace the quarrels with Austria broke out afresh; all the members of the League, save the three Forest districts and Glarus, joined the great union of the South German cities; but their attention was soon called to events nearer home. An attack on the custom-house at Rothenburg, and the gift of the privileges of burghership to the discontented inhabitants of the little town of Sempach, a short way off, so irritated Leopold III. (who then held all the possessions of his house outside Austria) that, unmindful of the defeat of his uncle at Morgarten in 1315, he collected a great army, with the intention of crushing his rebellious town. The decisive fight took place on July 9, 1386, near Sempach, on a bit of sloping meadowland, cut up by streams and hedges, which forced the Austrian knights to dismount. The great heat of the day, which rendered it impossible to fight in armor, and the furious attacks of the Confederates, finally broke the Austrian line, after more than one repulse, and turned the day (see WINKELRIED). Leopold, with a large number of his followers, was slain, and the Hapsburg power within the borders of the Confederation finally broken.

In 1389 a peace for seven years was made, the Confederates being secured in all their conquests; an attempt made in 1393 by Austria by means of Schöno, the chief magistrate of Zurich and leader of the patrician party, to stir up a fresh attack, failed owing to a rising of the burghers, who sympathized with the Confederates, and on July 16, 1394, the peace was prolonged for twenty years (and again in 1412 for fifty years), various stipulations being made by which the hundred years' struggle of the League to throw off all political dependence on the Hapsburgs was finally crowned with success.

The great victory at Sempach not merely vastly increased the fame of the Everlasting League but also enabled it to extend both its influence and its territory. The fifteenth century is the period when both the League and its several members took the aggressive.

In 1412 the treaty of 1394 between the League and the Hapsburgs had been renewed for fifty years; but when in 1415 Duke Frederick of Austria helped Pope John XXII. to escape from Constance, where the great council was then sitting, and the emperor Sigismund placed the duke under the ban of the empire, summoning all members of the empire to arm against him, the League hesitated, because of their treaty of 1412, till the emperor declared that all the rights and lands of Austria in the league were forfeited, and that their compact did not release them from their obligations to the empire. In the name, therefore, of the emperor, and by his special command, the different members of the League overran the extensive Hapsburg possessions in the Aargau.

Count Frederick, the last great feudal lord on the left bank of the Rhine, had managed to secure his vast possessions by making treaties with several members of the League, particularly Zurich (1402) and Schwyz (1417)—from 1428 inclining more and more to Schwyz (then ruled by Ital Reding), being disgusted with the arrogant behavior of Stüssi, the burgomaster of Zurich. His death (April 30, 1436) was the signal for the breaking out of strife. After being twice defeated, Zurich was forced in 1440 to buy peace by certain cessions (the Upper March) to Schwyz, the general feeling of the Confederates being opposed to Zurich, several of them going so far as to send men and arms to Schwyz. Zurich, however, was bitterly disappointed at these defeats, and had recourse to that policy which she had adopted in 1356 and 1393—an alliance with Austria (concluded in 1442), which now held the imperial throne in the person of Frederick III. In 1443 the Zurich troops were completely defeated at St. Jakob on the Sihl, close under the walls of the city, Stüssi himself being slain. Next year the city itself was long besieged. Frederick, unable to get help elsewhere, procured from Charles VII. of France the dispatch of a body of Armagnac free lances (the Écorcheurs), who came, 30,000 strong, under the dauphin Louis, plundering and harrying the land, till, at the very gates of the free imperial city of Basel, the desperate resistance of a small body of Confederates (1,200 to 1,500) till cut to pieces, checked the advance of the freebooters, who sustained such tremendous losses that, though the victors, they hastily made peace, and returned whence they had come. The William Tell myth (see TELL, *supra*) belongs to this date.

In 1439 Sigismund succeeded his father Frederick in the Hapsburg lands in Alsace, the Thurgau, and Tyrol, and, being much irritated by the constant encroachments of the Confederates, in particular by the loss of Rapperschwyl (1458), declared war against them, but fared very badly. In 1460 the Confederates overran the Thurgau, and occupied Sargans. They laid siege to Waldshut, and to buy them off Sigismund in August, 1468, engaged to pay 10,000 gulden as damages by June 24, 1469; in default of payment the Confederates were to keep forever the Black Forest, Waldshut, and certain other Black Forest towns on the Rhine. Sigismund did not know where to obtain the sum he had promised to pay. In this strait he turned to Charles the Bold (properly the Rash), duke of Burgundy, who was then beginning his wonderful career, and aiming at restoring the kingdom of Burgundy. On May 9, 1469, Charles promised to give Sigismund 50,000 florins, receiving as security for repayment Alsace, the Breisgau, the Sundgau, the Black Forest, and the four Forest towns on the Rhine (Rheinfelden, Säckingen, Lauffenburg, and Waldshut); in addition, Charles took Sigismund under his protection, specially against the Swiss, and agreed to give him aid in a war if he was attacked by them. The Swiss in these circumstances began to look toward Louis XI. of France, who had confirmed the treaty of friendship made with them by his father in 1452. Sigismund had applied to him early in 1469 to help him in his many troubles, and to give him aid against the Swiss, but Louis had point-blank refused. Anxious to secure their neutrality in case of his war with Charles, he made a treaty with them on August 13, 1470, to this effect.

The war in the west was begun by Bern and her allies (Freiburg, Solothurn, etc.) by marauding expeditions across the Jura, in which Héricourt (November, 1474) and Blamont (August, 1475) were taken, both towns being held of Charles by the "sires" de Neuchâtel, a cadet line of the counts of Montbéliard. Meanwhile Yolande, the duchess of Savoy, had, through fear of her brother Louis XI. and hatred of Bern, finally joined Charles and Milan (January, 1475), the immediate result of which was the capture, by the Bernese and friends of several places in Vaud. In the summer Bern seized on the Savoyard district of Aigle. Soon after (October–November, 1475) the same energetic policy won for her the Savoyard towns of Morat, Avenches, Estavayer, and Yverdun; while (September) the Upper Wallis, which had conquered all Lower or Savoyard Wallis, entered into alliance with Bern for the purpose of opposing Savoy by preventing the arrival of Milanese troops. Alarmed at their success, the emperor and Louis deserted (June–September) the Confederates, who thus, by the influence of Louis and Bernese ambition, saw themselves led on and then abandoned to the wrath of Charles, and very likely to lose their new conquests. They had entered on the war as "helpers" of the emperors, and now became principals in the war against Charles, who raised the siege of Neuss, made an alliance with Edward IV. of England, received the surrender of Lorraine, and hastened across the Jura (February, 1476) to the aid of his ally Yolande. On February 21st, Charles laid siege to Granson, and after a week's siege the garrison of Bernese and Freiburgers had to surrender, and, by way of retaliation for the massacre of the garrison of Estavayer in 1475, of the 412 men two only were spared in order to act as executioners of their comrades. This hideous news met a large body of the Confederates gathered together in great haste to relieve the garrison, and going to their rendezvous at Neuchâtel, where both the count and town had become allies of Bern in 1406. An advance body of Bernese, Freiburgers, and Schwyzers, in order to avoid the castle of Vauxmarcus (seized by Charles), by the Lake of Neuchâtel, on the direct road from Neuchâtel to Granson, climbed over a wooded spur to the north, and attacked (March 2d) the Burgundian outposts. Charles drew back his force in order to bring down the Swiss to the more level ground where his cavalry could act, but his rear misinterpreted the order, and when the main Swiss force appeared over the spur the Burgundian army was seized with a panic and fled in disorder. The Swiss had gained a glorious victory, and regained their conquest of Granson, besides capturing very rich spoil in Charles' camp, parts of which are preserved to the present day in various Swiss armories. Such was the famous battle of Granson. Charles at once retired to Lausanne, and set about reorganizing his army. He resolved to advance on Bern by way of Morat (or Murten), which was occupied by a Bernese garrison under Von Bubenberg, and laid siege to it on June 9th. The Confederates had now put away all jealousy of Bern, and collected a large army. The decisive battle took place on the afternoon of June 22d, after the arrival of the Zurich contingent under Hans Waldmann. English archers were in Charles' army, while with the Swiss was René, the dispossessed duke of Lorraine. After facing each other many hours in the driving rain, a body of Swiss, by outflanking Charles' van, stormed his palisaded camp, and the Burgundians were soon hopelessly beaten, the losses on both sides (a contrast to Granson) being exceedingly heavy. Vaud was reoccupied by the Swiss, Savoy having overrun it on Charles' advance; but Louis now stepped in and procured the restoration of Vaud to Savoy, save Granson, Morat, Orbe, and Échallens, which were to be held by the Bernese jointly with the Freiburgers, Aigle by Bern alone—Savoy at the same time renouncing all its claims over Freiburg. Thus French-speaking districts first became permanently connected with the Confederation, hitherto purely German, and the war had been one for the maintenance of recent conquests, rather than a purely defensive one against an encroaching neighbor desirous of crushing Swiss freedom.

These glorious victories really laid the foundation of Swiss nationality; but soon after them the long-standing jealousy between the civic and rural elements in the Confederation nearly broke it up.

With the object of strengthening the northern border of the Confederation, two more full members were admitted in 1501—Basel and Schaffhausen—on the same terms as Freiburg and Solothurn. A few years later, in 1513, Appenzell, which in 1411 had become a "protected" district, and in 1452 an "associate" member of the Confederation, was admitted as the thirteenth full member; and this remained the number till the fall of the old Confederation in 1798.

In the first years of the sixteenth century the influence of the Confederates south of the Alps was largely extended. In 1513 the Swiss completely defeated the French at Novara, and in 1514 Pace was sent by Henry VIII. of England to give pensions and get soldiers. Francis I. at once on his accession (1515) began to prepare to win back the Milanese, and, successfully evading the Swiss awaiting his descent from the Alps, beat them in a pitched battle at Marignano near Milan (September 13, 1515), which broke the Swiss power in North Italy, so that in 1516 a peace was made with France. This treaty was extended by another in 1521 (to which Zurich, then under Zwingli's influence, would not agree, holding aloof from the French alliance till 1614). These two treaties were the starting point and foundation of later French interference with Swiss affairs, which became more and more oppressive, and was not finally thrown off till 1814.

In 1499 the Swiss had practically renounced their allegiance to the emperor, the temporal chief of the world according to mediæval theory; and in the sixteenth century a great number of them did the same by the world's spiritual chief, the pope. The scene of the revolt was Zurich, and the leader Ulrich Zwingli. He bitterly opposed the French alliance and the pension and mercenary system. Hence in 1521 his influence kept Zurich back from joining in the treaty with Francis I. Zwingli now developed his views as to the greater weight which Zurich and Bern ought to have in the League. Quarrels too went on in the "common bailiwicks," for the members of the League who clung to the old faith had a majority of votes in matters relating to these districts. Zurich tried to cut off supplies of food from reaching the Catholic members (contrary to the wishes of Zwingli), and, on the death of the abbot of

St. Gall, disregarding the rights of Lucerne, Schwyz, and Glarus, who shared with her the office of protectors of the abbey, suppressed the monastery, giving the rule of the land and the people to her own officers. Bern in vain tried to moderate this aggressive policy, and the Catholic members of the League indignantly advanced toward Zurich. Near Kappel, on October 11, 1531, the Zurich vanguard under Göldli was surprised, and despite reinforcements, the men of Zurich were beaten, among the slain being Zwingli himself. Another defeat completed the discomfiture of Zurich, and by the second peace of Kappel (November, 1531) the principle of "parity" was recognized, not merely in the case of each member of the League and the "common bailiwicks," but also in that of each parish or "commune."

Bern had her eyes always fixed upon the Savoyard lands to the southwest, in which she had got a footing in 1475, and now made zeal for religious reforms the excuse for resuming her advance policy. The duke of Savoy, however, took up arms against Bern (1536), who overran Gex, Vaud, and the independent bishopric of Lausanne, as well as the Chablais to the south of the lake. Geneva was only saved by the unwillingness of the citizens. Bern thus ruled north and south of the lake, and carried matters with a high hand. Shortly after this John Calvin, a refugee from Picardy, was, when passing through Geneva, detained by Farel to aid him, and, after an exile from 1538 to 1541, owing to opposition of the papal party, and of the burghers, who objected to Bernese rule, he set up his wonderful theocratic government in the city, pushing Zwingli's principles to their ultimate conclusions (see SERVETUS). His theological views led to disputes with the Zurich Reformers, which were partly settled by the *Consensus Tigurinus* of 1549, and more completely by the *Helvetic Confession* of 1566, which formed the basis of union between the two parties.

By the time of Calvin's death (1564) the old faith had begun to take the offensive; the reforms made by the council of Trent urged on the Catholics to make an attempt to recover lost ground. Emmanuel Philibert, duke of Savoy, the hero of St. Quentin (1557), and one of the greatest generals of the day, with the support of the Catholic members of the League, demanded the restoration of the districts seized by Bern in 1536, and on October 30, 1564, the treaty of Lausanne confirmed the decision of the other Confederates sitting as arbitrators (according to the old constitutional custom). By this treaty Gex, the Genevois, and the Chablais were to be given back, while Vevey, Chillon, Lausanne, Yverdun were to be kept by Bern, who engaged to maintain the old rights and liberties of Vaud, which in 1565 were further placed under the special protection of France.

In the Thirty Years' War the Confederation remained neutral, being bound both to Austria (1474) and to France (1516), and neither religious party wishing to give the other an excuse for calling in foreign armies.

But by far the most important event in Swiss history in this age is the formal freeing of the Confederation from the empire. Basel had been admitted a member of the League in 1501, two years after the Confederation had been practically freed from the jurisdiction of the imperial chamber, though the city was included in the new division of the empire into "circles" (1521), which did not take in the older members of the Confederation. Basel, however, refused to admit this jurisdiction; the question was taken up by France and Sweden at the congress of Münster, and formed the subject of a special clause in the treaties of Westphalia, by which the city of Basel and the other "Helvetiorum cantones" were declared to be "in the possession of almost entire liberty and exemption from the empire, and *nullatenus* subject to the imperial tribunals." This was intended to mean exemption from all obligations to the empire (with which the Confederation was connected hereafter simply as a friend), and to be a definitive settlement of the question. Thus by the events of 1499 and 1648 the Confederation had become an independent European state, which, by the treaty of 1516, stood as regards France in a relation of neutrality. Throughout the seventeenth and eighteenth centuries the Confederation was practically a dependency of France. Between 1648 and 1798 the Confederation was distracted by religious divisions, and feelings ran very high.

The Confederation and France had been closely connected for so long that the outbreak of the French Revolution could not fail to affect the Swiss. The Helvetian Club, founded at Paris in 1790 by several exiled Vaudois and Freiburgers, was the center from which the new ideas were spread in the western part of the Confederation, and risings directed or stirred up. In 1790 Lower Wallis rose against the oppressive rule of the upper districts; in 1792 Porrentruy defied the prince-bishop of Basel, despite the imperial troops he summoned, declared the "Rauracian" republic, and, three months later, became the French department of the Mont Terrible; Geneva was only saved (1792) from France by a force sent from Zurich and Bern; and the massacre of the Swiss guard at the Tuilleries on August 10, 1792, aroused intense indignation. The diet was distracted by party struggles, and the fall of the old Confederation was not far distant. The rumors of the vast treasures stored up at Bern, and the desire of securing a bulwark against Austrian attack, specially turned the attention of the Directory toward the Confederation; and this was utilized by the heads of the reform party in the Confederation--Ochs, the burgomaster of Basel, and La Harpe, who had left his home in Vaud through disgust at Bernese oppression, both now wishing for aid from outside in order to free their land from the rule of the oligarchy. Hence, when La Harpe, at the head of twenty-two exiles from Vaud and Freiburg, called (November 20, 1797) on the Directory to protect the liberties of Vaud, which France by the treaty of 1565 was bound to guarantee, his appeal found a ready answer.

In 1798 French troops occupied Mühlhausen and Bienne. Another army entered Vaud (February, 1798), when the "Lemanic republic" was proclaimed, and the diet broke up in dismay without taking any steps to avert the coming storm. Brune and his army occupied Freiburg and Solothurn, and, after fierce fighting at Neueneck, entered (March 5th) Bern, deserted by her allies, and distracted by quarrels within. With Bern, the stronghold of the aristocratic party, fell the old Confederation. The Revolution triumphed throughout the Confederation. The proceedings of the French, however, soon turned into disgust and hatred the joyful feelings with which they had been hailed as liberators. Geneva was annexed to France (1798); Gersau, after an independent existence of over 400 years, was made a mere district of Schwyz; immense fines were levied and the treasury at Bern pillaged; the land was treated as if it had been conquered. The new republic was compelled to make a very close offensive and defensive alliance with France, and its directors were practically nominated from Paris. In 1799 Zurich, the Forest cantons, and Rhætia became the scene of the struggles of the Austrians (welcomed with joy) against the French and Russians. The manner too in which the reforms were carried out alienated many, and, soon after the Directory gave way to the Consulate in Paris (18 Brumaire or

November 10, 1799), the Helvetic directory (January, 1800) was replaced by an executive committee.

The scheme of the Helvetic republic had gone too far in the direction of centralization; but it was not easy to find the happy mean, and violent discussions went on between the "unitary" and "federalist" parties. Many drafts were put forward, and one actually submitted to but rejected by a popular vote (May 20, 1802). In July, 1802, the French troops were withdrawn from Switzerland by Bonaparte, ostensibly to comply with the treaty of Amiens, really to show the Swiss that their best hopes lay in appealing to him. The Helvetic government was gradually driven back by armed force, and the federalists seemed getting the best of it, when (October 4th) Bonaparte offered himself as mediator, and summoned many of the chief Swiss statesmen to Paris to discuss matters with him (the "Consulta"—December, 1802). He had long taken a very special interest in Swiss matters, and in 1802 had given to the Helvetic republic the Frickthal (ceded to France in 1801 by Austria), the last Austrian possession within the borders of the Confederation. In the discussions he pointed out that Swiss needs required a federal constitution and a neutral position guaranteed by France. Finally (February 19, 1803) he laid before the Consulta the Act of Mediation which he had elaborated, and which they had perforce to accept—a document which formed a new departure in the Swiss history, and the influence of which is visible in the present constitution.

For ten years Switzerland enjoyed peace and prosperity under the new constitution. Pestalozzi and Fellenberg worked out their educational theories; K. Escher of Zurich embanked the Linth, and was thence called "von der Linth"; the central Government prepared many schemes for the common welfare. In 1806 the principality of Neuchâtel was given to Marshal Berthier; Tessin was occupied by French troops from 1810 to 1813, and in 1810 Wallis was made into the department of the Simplon, so as to secure that pass. As soon as Napoleon's power began to wane (1812-13), the position of Switzerland became endangered. The powers exercised great pressure to bring about a meeting of deputies from all the nineteen cantons at Zurich (April 6, 1814, "the long diet"), but party strife was so bitter that many questions had to be referred to the congress sitting at Vienna. The congress decided (March 20, 1815) that Wallis, Neuchâtel, and Geneva should be raised from the rank of "associates" to that of full members of the Confederation (thus making up the familiar twenty-two), and as compensation gave Bern the town of Bienne (Biel) and all of the territories of the prince-bishop of Basel; but the Valtelline was granted to Austria, and Mühlhausen was not freed from France.

The diet accepted this decision on August 7, 1815. Finally the congress, on November 20, 1815, placed Switzerland and parts of North Savoy under the guarantee of the great powers, who engaged to maintain their neutrality, thus freeing Switzerland from her 300 years' subservience to France, and compensating in some degree for the reactionary nature of the new Swiss constitution when compared with that of 1803.

In Zurich the extreme pretentions of the radicals and freethinkers brought about a great reaction in 1839, when Zurich was the "Vorort." In Aargau the parties were very evenly balanced, and, when in 1840, on occasion of the revision of the constitution, the radicals had a popular majority, the aggrieved clerics stirred up a revolt (1840), which was put down, but which gave their opponents the excuse for carrying a vote in the great council to suppress the eight monasteries in the canton. This was flatly opposed to the pact of 1815, which the diet by a small majority decided must be upheld, though after many discussions it determined (August 31, 1843) to accept the compromise by which four only were to be suppressed, and declared that the matter was now settled. On this the seven Catholic cantons—Uri, Schwyz, Unterwalden, Lucerne, Zug, Freiburg, and Wallis—formed (September 7, 1843) a "Sonderbund" or separate league, which (February, 1844) issued a manifesto demanding the reopening of the question and the restoration of *all* the monasteries. In December, 1845, the Sonderbund turned itself into an armed confederation, ready to appeal to war in defense of the rights of each canton. On July 20, 1847, the diet, by a small majority, declared that the Sonderbund was contrary to the federal pact, which on August 16th it was resolved to revise, while on September 3d it was decided to invite each canton to expel the Jesuits. Most of the great powers favored the Sonderbund, but England took the contrary view. On October 29th the deputies of the unyielding cantons left the diet, which ordered on November 4th that its decree should be enforced by arms. The war was short (November 11–29), mainly owing to the ability of Dufour, and the loss of life trifling. One after another the rebellious cantons were forced to surrender, and, as the Paris revolution of February, 1848, occupied all the attention of the great powers (who by the constitution of 1815 should have been consulted in the revision of the pact), the Swiss were enabled to settle their own affairs quietly. The diet meanwhile debated the draft constitution drawn up by Kern of Thurgau and Druey of Vaud, which in the summer of 1848 was accepted by fifteen and a half cantons, the minority consisting of the three Forest cantons, and it was proclaimed on September 12th.

The position of Neuchâtel, as a member of the Confederation (as regards its government only) and as a principality ruled by the king of Prussia, whose rights had been expressly recognized by the congress of Vienna, was uncertain. She had not sent troops in 1847, and, though in 1848 there was a revolution there, the prince did not recognize the changes. Finally, a royalist conspiracy in September, 1856, to undo the work of 1848, caused great excitement and anger in Switzerland, and it was only by the mediation of Napoleon III. and the other powers that the prince renounced (1857) all his rights, save his title, which his successor (the German emperor) has also dropped. Since that time Neuchâtel has been an ordinary member of the Confederation. In 1859-60 the cession of Savoy to France aroused considerable indignation, and in 1862 the long-standing question of frontiers in the Vallée de Dappes was finally arranged with France. In 1871 many French refugees, especially Bourbaki's army, were most hospitably received and sheltered. Perhaps the latest event of importance to Switzerland was the opening of the St. Gotthard tunnel, which was begun in 1871 and ended in 1880; by it the Forest cantons seem likely to regain the importance which was theirs in the early days of the Confederation.

SWORD. The sword is a hand-weapon of metal, distinct from all missile weapons on the one hand, and on the other hand from staff-weapons—the pike, bill, halberd, and the like—in which the metal head or blade occupies only a fraction of the effective length. The handle of a sword provides a grip for the hand that wields it, or sometimes for two hands; it may add protection, and in most patterns does so to a greater or less extent. But it is altogether subordinate to the blade. For want of a metal-headed lance or ax, which indeed were of later invention, a sharpened pole or a thin edged paddle will serve the turn. A sword-handle without a blade is naught; and no true sword-blade can be made save of metal capable of taking an edge. There are so-called swords of wood and even stone to be found in collections of savage weapons. But these are really flattened clubs.

It is difficult as a matter of verbal definition to distinguish the sword from smaller hand-weapons. Thus an ordinary sword is four or five times as long as an ordinary dagger: but there are long daggers and short swords; neither will the form of blade or handle afford any certain test. The real difference lies in the intended use of the weapon; we associate the sword with open combat, the dagger with a secret attack or the sudden defense opposed to it. One might say that a weapon too large to be concealed about the person cannot be called a dagger. Again, there are large knives, such as those used by the Afridis and Afghans, which can be distinguished from swords only by the greater breadth of the blade as compared with its length. Again, there are special types of arms, of which the yataghan is a good example, which in their usual forms do not look much like swords, but in others that occur must be classed as varieties of the sword, unless we keep them separate by a more or less artificial theory, referring the type as a whole to a different origin.

Of the actual origin of swords we have no direct evidence. Neither does the English word nor, so far as we are aware, any of the equivalent words in other languages, Aryan or otherwise, throw any light on the matter. We only know that swords are found from the earliest times of which we have any record among all people who have acquired any skill in metal-work. There are two very ancient types, which we may call the straight-edged and the leaf-shaped. Assyrian monuments represent a straight and narrow sword, apparently better fitted for thrusting than cutting. Bronze swords of this form have actually been found in Etruscan tombs, and by Doctor Schliemann at Mycenæ, side by side with leaf-shaped specimens. We have also from Mycenæ some very curious and elaborately wrought blades, so broad and short that they must be called ornamental daggers rather than swords. The leaf-shaped blade is common everywhere among the remains of men in the " Bronze Period " of civilization, and this was the shape used by the Greeks in historical times, and is the shape familiar to us in Greek works of art. Asiatics to this day treat the sword merely as a cutting weapon, and most Asiatic swords are incapable of being handled in any other way.

The normal types of swords which we meet with in historical times, and from which all forms now in use among civilized nations are derived, may be broadly classified as straight-edged or curved. In the straight-edged type, in itself a very ancient one, either thrusting or cutting qualities may predominate, and the blade may be double-edged or single-edged. The double-edged form was prevalent in Europe down to the seventeenth century. The single-edged blade, or back-sword as it was called in England, is well exemplified in the Scottish weapons commonly but improperly known as claymores, and is now exclusively employed for military weapons. But these, with few exceptions, have been more or less influenced by the curved Oriental saber. Among early double-edged swords the Roman pattern stands out as a workmanlike and formidable weapon for close fight; the point was used by preference. In the Middle Ages the Roman tradition disappeared, and a new start was made from the clumsy barbarian arm which the Romans had despised. Gradually the broad and all but pointless blade was lightened and tapered, and the thrust, although its real power was unknown, was more or less practiced.

Quite different from the European models is the crescent-shaped Asiatic saber, commonly called scimitar. We are not acquainted with any distinct evidence as to the origin of this in time or place. The fame of the Damascus manufacture of sword-blades is of great antiquity, as is also that of Khorásán, still the center of the best Eastern work of this kind. Whoever first made these blades had conceived a very definite idea—that of gaining a maximum of cutting power regardless of loss in other qualities—and executed it in a manner not to be improved upon. The action of the curved edge in delivering a blow is to present an oblique and therefore highly acute-angled section of the blade to the object struck, so that in effect the cut is given with a finer edge than could safely be put on the blade in its direct transverse section. In a well-made saber the setting of the blade with regard to the handle (" leading forward ") is likewise ordered with a view to this result. And the cutting power of a weapon so shaped and mounted is undoubtedly very great.

In the course of the sixteenth century the straight two-edged sword of all work was lengthened, narrowed, and more finely pointed, till it became the Italian and Spanish rapier, a weapon still furnished with cutting edges, but used chiefly for thrusting. We cannot say how far this transition was influenced by the *estoc*, a mediæval thrusting weapon carried by horsemen rather as an auxiliary lance than as a sword. The Roman preference of the point was rediscovered under new conditions, and fencing became an art. Its progress was from pedantic complication to lucidity and simplicity, and the fashion of the weapon was simplified also. Early in the eighteenth century, the use of the edge having been finally abandoned in rapier-play, the two-edged blade was supplanted by the bayonet-shaped French dueling sword, on which no improvement has since been made except in giving it a still simpler guard. The name of rapier is often but wrongly given to this by English writers. About the same time, or a little earlier, the primacy of the art passed from Italy to France, and there it still remains.

Mechanical invention has not been able to supersede or equal hand-work in the production of good sword-blades. The swordsmith's craft is still, no less than it was in the Middle Ages, essentially a handicraft, and it requires a high order of skill. His rough material is a bar of cast and hammered steel tapering from the center to the ends ; when this is cut in two, each half is made into a sword. The " tang " which fits into the handle is not part of the blade, but a piece of wrought iron welded on to its base. From this first stage to the finishing of the point it is all hammer-and-anvil work. Special tools are used to form grooves in the blade according to the regulation or other pattern desired, but the shape and weight of the blade are fixed wholly by the skilled hand and eye of the smith. Measuring tools are at hand, but are little used. Great care is necessary to avoid overheating the metal, which would produce a brittle crystalline grain, and to keep the surface free from oxide, which would be injurious if hammered in. In tempering the blade the workman judges of the proper heat by the color. Water is preferred to oil by the best makers, nothwithstanding that tempering in oil is much easier. With oil there is not the same risk of the blade coming out distorted and having to be forged straight again (a risk, however, which the expert swordsmith can generally avoid); but the steel is only surface-hardened, and the blade therefore remains liable to bend. Machinery comes into play only for grinding and polishing, and to some extent in the manufacture of hilts and appurtenances. The finished blade is proved by being caused to strike a violent blow on a solid block with the two sides flat, with the edge, and lastly with the back; after this the blade is bent flatwise in both directions by hand, and finally the point is driven through a steel plate about an eighth of an inch thick. In spite of all the care that can be used both in choice of material and in workmanship, about 40 per cent. of the blades thus tried fail to stand the proof, and are rejected. The process we have briefly described is that of making a really good sword; of course plenty of cheaper and commoner weapons are in the market, but they are hardly fit to trust a man's life to. The best Eastern blades are justly celebrated, but they are not better than the best European ones; in fact European swords are often met with in Asiatic hands, remounted in Eastern fashion. The "damascening" or "watering" of choice Persian and Indian arms is not a secret of workmanship, but is due to the peculiar manner of making the Indian steel itself, in which a crystallizing process is set up; when metal of this texture is forged out, the result is a more or less regular wavy pattern running through it. No difference is made by this in the practical qualities of the blade.

SWORD-FISH. Sword-fishes are a small family of spiny-rayed fishes (*Xiphiidæ*), the principal characteristic of which consists in the prolongation of the upper jaw into a long pointed sword-like weapon. The "sword" is formed by the coalescence of the intermaxillary and maxillary bones, which possess an extremely hard texture; it has the shape of a much elongated cone, more or less flattened throughout its whole length; the end is sharply pointed. It is smooth above and on the upper part of the sides, and rough below owing to the presence of innumerable rudimentary teeth, which have no function.

Sword-fishes are truly pelagic fishes, which either singly or in pairs or in smaller or larger companies roam over the oceans of the tropical and subtropical zones of both hemispheres. Some species wander regularly or stray far into the temperate seas. Some of the tropical forms are the largest of Acanthopterygian fishes, and not exceeded in size by any other Teleostean; such species attain to a length of from twelve to fifteen feet, and swords have been preserved more than three feet long and with a diameter of at least three inches at the base.

The food of the sword-fishes is the same as that of tunnies, and consists of smaller fish, and probably also in great measure of pelagic cuttle-fishes. It has been ascertained by actual observation that sword-fishes procure their food by dashing into a school of fishes, piercing and killing a number of them with their swords; and this kind of weapon would seem to be also particularly serviceable in killing large cuttle-fish, like the saw of saw-fishes, which is used for the same purpose. But the swords of the large species of *Histiophorus* and *Tetrapturus* are, besides, most formidable weapons of aggression. These fishes never hesitate to attack whales and other large cetaceans, and, by repeatedly stabbing them, generally retire from the combat victorious. The cause which excites sword-fishes to such attacks is unknown; but they follow the instinct so blindly that they not rarely assail boats and ships in a similar manner, evidently mistaking them for cetaceans. They easily pierce the light canoes of the natives of the Pacific islands and the heavier boats of the professional sword-fish fishermen, often dangerously wounding the persons sitting in them. Attacks by sword-fishes on ocean-going ships are so common as to be included among sea-risks; they are known to have driven their weapon through copper-sheathing, oak-plank, and timber to a depth of nearly ten inches, part of the sword projecting into the inside of the ship. Among the specimens of planking pierced by sword-fishes which are preserved in the British Museum there is one less than a foot square which incloses the broken ends of three swords, as if the fishes had had the object of concentrating their attack on the same vulnerable point of their supposed enemy. The part of the sword which penetrates a ship's side is almost always broken off and remains in the wood, as the fish is unable to execute sufficiently powerful backward movements to free itself by extracting the sword.

In the Mediterranean and on the Atlantic coasts of the United States the capture of sword-fishes forms a regular branch of the fishing-industry. The object of the fishery in the Mediterranean is the common European sword-fish (*Xiphias gladius*), the average weight of which is about one hundred weight, and which is abundant off the Sicilian coasts and on the opposite coast of Calabria.

On the coast of the United States a different species, *Histiophorus gladius*, occurs; it is a larger fish than the Mediterranean sword-fish, attaining to a length of from 7 to 12 feet, and an average weight of 300 or 400 pounds. It is captured only by the use of the harpoon. From forty to fifty vessels, schooners of some fifty tons, are annually engaged in this fishery, with an aggregate catch amounting annually to about 3,400 sword-fishes, of a value of $45,000. The flesh of this species is inferior in flavor to that of the Mediterranean species, and is principally consumed after having been preserved in salt or brine.

SYBARIS, a city of Magna Græcia, on the Gulf of Tarentum, between the rivers Crathis (Crati) and Sybaris (Coscile), which now meet three miles from the sea, but anciently had independent mouths, was the oldest Greek colony in this region. It was an Achæan colony founded by Isus of Helice (720 B.C.), but had among its settlers many Trœzenians, who were ultimately expelled. For magnificence and luxury the Sybarites were proverbial throughout Greece, and in the sixth century probably no Hellenic city could compare with its wealth and splendor. At length contests between the democrats and oligarchs, in which many of the latter were expelled and took refuge at Crotona, led to a war with that city, and the Crotoniats with very inferior forces were completely victorious. They razed Sybaris to the ground and turned the waters of Crathis to flow over its ruins, (510 B.C.)

SYCAMORE. See MAPLE.

SYDENHAM, a suburb of London, in the county of Kent, is finely situated, chiefly on elevated ground about seven miles south of London. Formerly Sydenham was a small hamlet of Lewisham, which rose into favor from its sylvan beauty, its pleasant situation, and its medicinal waters. These springs were discovered in 1640 on Sydenham common. After the construction of a railway the suburb grew into high repute as a residence, especially for the wealthier commercial and professional classes. The construction of the Crystal Palace (see LONDON), in 1854, greatly aided the prosperity of Sydenham, although the building is not within its boundaries. The population of the township (area, 1,623 acres) was 36,076 in 1889.

SYDENHAM, THOMAS, "the English Hippocrates," was born in Dorset in 1624. At the age of eighteen he was entered at Magdalen Hall, Oxford; after two years his college studies appear to have been interrupted, and he served for a time as an officer in the army of the Parliament. He completed his Oxford course in 1648, graduating as bachelor of medicine, and about the same time he was elected a fellow of All Souls' College. It was not until nearly thirty years later (1676) that he graduated as M.D., not at Oxford, but at Pembroke Hall, Cambridge, where his eldest son was then an undergraduate. His interest in medicine seems to have been aroused at an early age. Nothing is known of Sydenham's life between 1648 and 1663; but it is probable that he spent part of the time at Oxford. Sydenham attracted to him in warm friendship some of the most discriminating men of his time, such as John Locke and Robert Boyle. His first book, *Methodus Curandi Febres*, was published in 1666; a second edition, with an additional chapter on the plague, in 1668; and a third edition, much enlarged and bearing the better-known title of *Observationes Medicæ*, in 1676. His next publication was in 1680 in the form of two *Epistolæ Responsoriæ*, the one, "On Epidemics," addressed to Brady, regius professor of physic at Cambridge, and the other, "On the Lues Venerea," to Paman, public orator at Cambridge and Gresham professor in London. In 1682 he issued another *Dissertatio Epistolaris*, on the treatment of confluent smallpox and on hysteria, addressed to Dr. Cole of Worcester. The *Tractatus de Podagra et Hydrope* came out in 1683, and the *Schedula Monitoria de Novæ Febris Ingressu* in 1686. His last completed work, *Processus Integri*, is an outline sketch of pathology and practice. A fragment on pulmonary consumption was found among his papers. His collected writings occupy about 600 pages 8vo in the original Latin. Hardly anything is known of Sydenham's personal history in London. He died in an acute paroxysm of gout in December, 1689.

SYDNEY, the capital of New South Wales, and the oldest city in Australia, is situated on the east coast of that island-continent. It lies on the southern shore of the magnificent harbor of Port Jackson, which in 1770 was named, though not discovered, by Captain Cook. He anchored and landed in Botany Bay, about six miles to the south, and on afterward coasting to the north noted what looked like an inlet, to which he gave the name of Port Jackson, after Sir George Jackson, one of the secretaries to the admiralty. It may seem strange that so careful an observer as Cook should have passed close to one of the finest harbors in the world without recognizing its capacity; but the cliffs which guard the entrance are 300 feet in height, and no view of the landlocked basin can be seen from the masthead. This topographical peculiarity gives to the port its great shelter. When in 1788 Captain Phillip arrived at Botany Bay with the first convict fleet, he found its shallow waters and flat shores unsuited for the purposes of a settlement. Going northward, he turned in to examine Port Jackson inlet. Thither the fleet was instantly removed; and Sydney was founded, and Australian colonization started, on January 26, 1788. Captain Phillip's choice of a site was determined by the existence of fresh water in a small stream running into Sydney Cove.

The port is flanked on both sides by a number of promontories—its characteristic feature—so that, in addition to a broad central channel with deep water, there is both on the north and the south side a series of sheltered bays with good anchorage. The entrance is a mile wide, with a minimum depth of fifteen fathoms.

The metropolitan area of Sydney really consists of a peninsula about thirteen miles in length, lying between Parramatta and George's rivers. The sea frontage of this area, from the South Head of Port Jackson to the North Head of Botany Bay, is twelve miles in length, and consists alternately of bold cliffs and beautiful beaches. Sydney occupies, therefore, a position enjoying singular natural advantages.

The area of the city is 2,670 acres, of which no part is more than a mile and a quarter distant from the water, while the average distance is three-quarters of a mile. The surface contour is undulating, the maximum elevation being 230 feet and the average 120. The soil is sandstone, covered more or less with shaly clay. Of the city area about 800 acres are devoted to public use.

The city started from the banks of the Tank stream at the head of Sydney Cove, and the chief business part is still in the limited area lying between Darling Harbor and the Domain and Hyde Park. The streets are irregular in width, some of them narrow and close together, while those leading down to Darling Harbor have a steep incline. Sydney has consequently more the look of an Old-World city than any other in Australia, and in its lack of spacious promenades and open squares and places, and in its poor opportunity for displaying its public buildings, it contrasts unfavorably with the more symmetrically planned sister cities of Australia. On the other hand, it has a charm which is all its own, as the glimpses of the harbor and the shipping obtainable from so many points give a delightful variety to the street vistas. The principal business street is George street, two miles long, flanked with handsome commercial buildings. In this street are the postoffice, the town-hall, the cathedral, and the main railway station. Only second in importance is Pitt street, which runs nearly parallel with it as far as the railway station.

The public and private buildings of Old Sydney are of a primitive order of architecture, but they are rapidly disappearing as the city is being rebuilt. With the exception of Government House, the university and affiliated colleges, and the registrar-general's office, all the non-ecclesiastical public buildings are in a classical style. Of the modern public buildings the museum, the postoffice, the offices for the colonial secretary, the minister for public works, and the minister for lands, and the custom-house are the finest. The town-hall is a fine building, but a little too florid; the great hall, when finished, will be the largest in Australia. The Anglican cathedral in George street is small. A Roman Catholic cathedral, on the east side of Hyde Park, replaces an earlier one that was burnt down, and will, when completed, be the finest ecclesiastical edifice in the city. The mint (an adaptation of an old hospital) is an imperial establishment, the cost of which is defrayed by the colonists. The annual value of the coinage from local gold is about $2,500,000, and this coinage has imperial currency. All the large public buildings are constructed of Sydney sandstone, which is abundant in quantity, though variable in quality.

The length of streets, lanes, and public ways is about 100 miles. These are mostly macadamized, but wood paving has lately come much into favor. The saleyards for cattle and sheep (area forty acres) are seven miles off, at Homebush. For municipal purposes the city is divided into eight wards, each returning three aldermen, and for parliamentary purposes into three electorates—east, west, and south—each returning four members. In 1881 the city population was 105,000. Now (1890) officially estimated, with its suburbs, at 366,684. Communication with the suburbs is maintained to a large extent by steam tramways, entirely in the hands of the government. The whole district between Sydney and Paramatta is practically suburban for two miles on each side of the railway. The fashionable suburbs lie to the east of Sydney, the business extension of the city being more to the westward. The southern side is largely devoted to manufacturing operations, and population is rapidly extending in the direction of Botany Bay.

The old system of sewerage having several outfalls along the city front proved so objectionable that a new system has been designed, and is in course of execution, whereby the harbor will be preserved from all pollution.

A great drain is carried from the city to the ocean at a projecting headland north of Bondi Bay known as Ben Buckler, where the sewage will go at once into deep water with a southerly current.

Port Jackson being the chief naval depot of Australasia and the headquarters of the admiral's station, the fortifications of the harbor have engaged the attention of successive governments. The inner line of defense constructed by Sir William Denison has been superseded by more elaborate works. On the north side of the harbor Middle Head, George's Head, and Bradley's Head have powerful guns, which cross-fire with those on the South Head, completely commanding the entrance to the channel. There is also a very effective torpedo service.

Sydney is in the center of a great coal-basin, the eastern part of which is supposed to be under the sea; whether a workable seam exists under the city itself, and, if so, at what depth, is at present undetermined, borings of 2,000 feet having as yet failed to strike the coal. The seams crop out at Lake Macquarie, north of Sydney, and dip to the south; they also rise to the surface at the south of Sydney, where they dip to the north. Coal is also brought into the city by railway from the Blue Mountains and from the Mittagong district, but it is inferior in quality to that mined on the coast.

The abundance and cheapness of coal, as well as the natural and commercial advantages of Sydney, have been favorable to certain lines of manufacturing industry, notwithstanding the high price of labor. In addition to the industries connected with shipping, those connected with the pastoral industry have also been developed, such as tanning, glue-making, meat-preserving, etc. The large railway works have, under the patronage of the government, led to the manufacture of locomotives, and nearly all the rolling stock is made in the colonies. Omnibuses, cabs, carriages, buggies, drays, and carts are made in every variety and of excellent quality, as is also harness. Bootmaking is an extensive business; there are also manufactories of tobacco, sugar, kerosene, spirits, beer, tweed, paper, furniture, glass, pottery, and stoves, as well as a great variety of minor industries.

Public schools abound, with merely nominal fees. There is a high school for boys and girls. To the handsome university buildings a medical school is now being added. The great hall is the finest Gothic building in Australasia. The university is a teaching as well as examining institution, degrees being given in the four faculties of arts, medicine, law, and science. There is a good school of arts, with 400 members, and a good circulating library. The public free library is supported by the government, and to it is attached a lending branch. The Royal Society has a roll of 500 members, meets periodically for the reading and discussion of scientific papers, publishes its transactions, and has a small library. The Linnæan Society is also well supported, and a Geographical Society has lately been started. The museum, in College street, is managed by trustees and supported wholly at the cost of the government.

Sydney has many charitable institutions. It has three hospitals, the newest and largest, which is close to the university, having been built after the best European models. There are three large lunatic asylums in the suburbs; the latest is on the pavilion principle. The benevolent asylum, which is mainly supported by the government, gives a large amount of outdoor assistance, takes in all waifs and strays, and acts as a lying-in hospital. Old men are provided for in an institution at Liverpool. At Randwick is an asylum for destitute children, which receives a large amount of government support; and there are two orphan asylums at Parramatta; but the state children are now being boarded out under the auspices of a government board. There are two soup-kitchens and refuges, supported by private contributions, and also a charity organization society. There is a home visiting and relief society, intended principally for those who have known better days, and a prisoners' aid society, besides numerous friendly societies. All the churches are well represented, and to each is attached one or more charitable agencies.

The climate of Sydney is mild and moderately equable. It resembles closely the climate of Toulon. The mean temperature is 62.6° Fahr. and the extreme range of the shade thermometer is from 106° to 36° Fahr. The sea-breeze which prevails during the summer comes from the northeast, and, while it tempers the heat, makes the air moist and induces languor. In winter the prevailing wind is from the west, and the air is dry and bracing. The annual rainfall is fifty inches. The hot northwest wind of summer sometimes sends the humidity down below 30°, and once it has been as low as 16°. In the cool westerly winds of winter it seldom falls to 55°, and never below 45°. The average humidity for the year is 74°. The mean tide is three feet three inches.

SYENE (ASWÁN). See EGYPT.

SYENITE. A rock resembling GRANITE, (*q. v.*)

SYLBURG, FRIEDRICH, an eminent Greek scholar, and one of the greatest figures in the annals of German philology, was the son of a farmer, and was born at Wetter near Marburg in 1536 His studies were continued at Marburg and Jena, and then at Geneva (1559) and at Paris. Here his teacher was Henry Estienne (Stephens), to whose great Greek *Thesaurus* Sylburg afterward made important contributions. Returning to Germany, he was for a time a schoolmaster at Neuhaus near Worms, and then head of a new gymnasium at Lich, where he edited a useful edition of Nicolas Cleynart's *Greek Grammar* (Frankfort, 1580), which was thrice reprinted during his lifetime. But the period of his important literary labors began when (having previously, in 1581, declined a call to the Greek chair at Marburg) he resigned his post at Lich and moved to Frankfort to act as correcter and editor of Greek texts for the enterprising publisher J. Wechel. All Sylburg's editions show great critical power and indefatigable industry. Indeed he wore himself out with work, and died on February 16, 1596.

SYLHET, a British district of India, in the province of Assam. It is bounded on the North by the Khási and Jaintia Hills district, on the East by Cachar, on the South by the State of Hill Tipperah and the district of Tipperah, and on the West by the district of Maimansinh. Sylhet consists of the lower valley of the Surma or Barak river, and for the most part is a uniform level, broken only by scattered clusters of sandy hillocks called *tilás*, and intersected by a network of rivers and drainage channels. The wild animals of the district comprise elephants, tigers, buffaloes, bison, and several varieties of deer. The climate of Sylhet is extremely damp and the rainfall is heavy, reaching an annual average of over 150 inches; the rainy season generally lasts from April to October.

In 1881 the population was returned at 1,969,009, of whom 999,785 were males and 969,224 females. Hindus numbered 949,353, Mohammedans 1,015,531, and hill tribes 3,708. The only places with a population exceeding 5,000 are Sylhet town (14,407) and Kashba Baniachang, a large village (24,061).

SYLT (probably from the Old Frisian *Silendi*, *i.e.*, "sealand") is the largest German island in the North Sea, being forty square miles in area and nearly twenty.

three miles long. It is, however, very narrow, generally about half a mile in width, except in the middle, where it sends out a peninsula seven miles across. It belongs to the province of Schleswig-Holstein, and lies from seven to twelve miles from the Schleswig coast. The inhabitants, about 3,000 in number, are of Frisian origin, though a few in the extreme north of the island speak Danish. Their occupations are fishing, oyster-dredging, seamanship, and wild-duck catching; the women make large quantities of woolen jackets.

SYLVESTER. See SILVESTER.

SYMBOL. See CREEDS.

SYME, JAMES, surgeon, was born at Edinburgh on November 7, 1799. James was sent to the high school at the age of nine, and remained there until he was fifteen, when he entered the university. For two years he frequented the arts classes (including botany), and in 1817 began the medical curriculum, devoting himself with particular keenness to chemistry. His chemical experiments led him to the discovery that "a valuable substance is obtainable from coal tar which has the property of dissolving india-rubber," and could be used for waterproofing silk and other textile fabrics —an idea which was patented a few months afterward by Macintosh of Glasgow.

Announcing his intention to practice surgery only, Syme started a surgical hospital of his own, Minto House hospital, which he carried on from May, 1829, to September, 1833, with great success as a surgical charity and school of clinical instruction. It was here that he first put into practice his method of clinical teaching, which consisted in having the patients to be operated or prelected upon brought from the ward into a lecture-room or theater where the students were seated conveniently for seeing and taking notes. When Liston removed to London, in 1835, Syme became the leading consulting surgeon in Scotland. On Liston's death in 1847, Syme was offered his vacant chair of clinical surgery at University College, London, and accepted it. He began practice in London in February, 1848. He returned to Edinburgh in July, and was reinstated in his old chair, which the crown authority had meanwhile found a difficulty in appointing to. In April, 1869, he had a paralytic seizure, and at once resigned his chair; he never recovered his powers, and died on June 26, 1870.

SYMEON OF DURHAM was the author of two works of great importance in English history, especially in that of northern England, viz., the *Historia Dunelmensis Ecclesiæ* and the *Historia Regum*. Very little is known of his life. There is no record of the date of his birth or death. He was at Jarrow about 1080, before the monastic community moved thence to Durham (1083). He probably did not become a professed monk till some time after that event.

SYMEON, surnamed METAPHRASTES, Byzantine hagiographer, according to Leo Allatius (*De Symeonum Scriptis*, Paris, 1664), lived during the first half of the tenth century under Leo the philosopher and his successor at Constantinople, where he successively held the positions of secretary, grand logothete, and master of the palace.

SYMMACHUS, pope from 498 to 514, had Anastasius II. for his predecessor and was himself followed by Hormisdas. He was a native of Sardinia, apparently a convert from paganism, and was in deacon's orders at the time of his election. The choice was not unanimous, another candidate, Laurentius, having the support of a strong Byzantine party; and both competitors were consecrated by their friends, the one in the Lateran church and the other in that of St. Mary, on November 22, 498.

SYMMACHUS, QUINTUS AURELIUS, consul in 391, and one of the most brilliant representatives in public life and in literature of the old pagan party at Rome, was educated in Gaul, and having discharged the functions of prætor and quæstor, rose to higher offices, and in 373 was proconsul of Africa. His public dignities, which included that of pontiff, his great wealth and high character, added to his reputation for eloquence, marked him out as the champion of the pagan senate against the measures which the Christian emperors directed against the old state religion of Rome. In 382 he was banished from Rome by Gratian for his protest against the removal of the statue and altar of Victory from the senate-house, and in 384, when he was prefect of the city, he addressed to Valentinian a letter praying for the restoration of these symbols.

SYMPHONY. See MUSIC.

SYNAGOGUE (*συναγωγή*), literally "assemblage," is the term employed to denote either a congregation of Jews, *i.e.*, a local circle accustomed to meet together for worship and religious instruction, or the building in which the congregation met. In the first sense the word is a translation of כנסת, *keneseth*, in the second of בית הכנסת, *bêth hakkeneseth*. The germ of the synagogue, that is, of religious assemblages dissociated from the ancient ritual of the altar, may be found in the circle of the prophets and their disciples (see especially Isa. viii. 16 *seq.*); but the synagogue as an institution characteristic of Judaism arose after the work of Ezra, and is closely connected with the development of that legal Judaism to which his reformation gave definite shape. From the time of Ezra downward it was the business of every Jew to know the law; the school (*bêth hammidrāsh*) trained scholars, but the synagogue, where the law was read every Sabbath (Acts xv. 21), was the means of popular instruction. Such synagogues existed in all parts of Judea in the time of Psalm lxxiv. 8 (probably a psalm of the Persian period); in Acts xv. 21 it appears that they had existed for many generations "in every city."

Jewish tradition has a great deal to say about a body called "the great synagogue," which is supposed to have been the supreme religious authority from the cessation of prophecy to the time of the high priest Simeon the Just, and is even said (by modern writers since Elias Levita) to have fixed the Old Testament canon. But Kuenen in his essay "Over de Mannen der Groote Synagoge" has shown that these traditions are fiction, and that the name *keneseth haggādôla* originally denoted, not a standing authority, but the great convocation of Neh. viii.-x.

SYNEDRIUM (*συνέδριον*), a Greek word which means "assembly" and is especially used of judicial or representative assemblies, is the name by which (or by its Hebrew transcription, סנהדרין, *sanhedrîn*, *sanhedrîm*) that Jewish body is known which in its origin was the municipal council of Jerusalem, but acquired extended functions and no small authority and influence over the Jews at large. In the Mishnah it is called "the sanhedrin," "the great sanhedrin," "the sanhedrin of seventy-one [members]," and "the great court of justice" (*bêth dîn haggādôl*). The oldest testimony to the existence and constitution of the synedrium of Jerusalem is probably to be found in 2 Chron. xix. 8; for the priests, Levites, and hereditary heads of houses there spoken of as sitting at Jerusalem as a court of appeal from the local judicatories does not correspond with anything mentioned in the old history, and it is the practice of the Chronicler to refer the institutions of his own time to an origin in ancient Israel.

The council-chamber (*βουλή*) where the synedrium usually sat was between the Xystus and the temple, probably on the temple-hill, but hardly, as the Mishnah states, within the inner court. The meeting in the palace of the high priest which condemned our Lord was exceptional. The proceedings also on this occasion were highly irregular, if measured by the rules of procedure which, according to Jewish tradition, were laid down to secure order and a fair trial for the accused.

SYNESIUS, bishop of Ptolemais in the Libyan Pentapolis from 410 to *c.* 414, was born of wealthy parents, who claimed descent from Spartan kings, at Cyrene about 375. While still a youth (393) he went with his brother Euoptius to Alexandria, where he became an enthusiastic Neoplatonist and disciple of HYPATIA, (*q.v.*) Returning to his native place some time before 397, he was in that year chosen to head an embassy from the cities of the Pentapolis to the imperial court to ask for remission of taxation and other relief. His stay in Constantinople, which lasted three years, was wearisome and otherwise disagreeable; the leisure it forced upon him he devoted in part to literary composition. The oration he delivered when at last admitted to the presence of Arcadius is also extant. Returning abruptly to Cyrene in 400, he spent the next ten years partly in that city. He died in 414 A.D.

SYNOD. See COUNCIL and PRESBYTERIANISM.

SYPHILIS. See VENEREAL DISEASES.

SYRA, or SYROS, a Greek island in the middle of the Cyclades, which in the nineteenth century has become the commercial center of the Archipelago, and is also the residence of the nomarch of the Cyclades and the seat of the central law courts. In ancient times this island was remarkably fertile, as is to be gathered not only from the Homeric description (*Od.* xv. 403), which might be of doubtful application, but also from the remains of olive presses and peculiarities in the local nomenclature. The length of the island is about ten miles, the breadth five, and the area is estimated at forty-two and one-half square miles. The population is now estimated to number about 33,700, of whom about 20,500 are in the chief town. Commerce is the main occupation of the islanders, though they also build ships, have extensive tanneries, large steam flour-mills, a steam weaving and ro factory. The ancient capital was Hermupolis.

SYRACUSE (*Συράκοσαι, Συράκουσαι, Συρήκουσαι*; Lat. *Syracusæ;* It. *Siracusa*), the chief Greek city of ancient Sicily and one of the earliest Greek settlements in the island (see SICILY). The first settlement was on a small island, parted from the coast by a very narrow channel. It points southward, in front of a deep bay, which, with the opposite headland (Plemmyrium), it helps to shelter from the sea. This formed the Great Harbor; the Lesser Harbor of Laccius lay to the north of the island, between it and a peninsula of the mainland, with the open sea to the east and north.

The island was called Ortygia, a name connected with the Delian legend of Artemis (886), but often simply the Island. Though the lowest part of the city, its position and strength made it the citadel, and it is therefore often spoken of by Diodorus and Plutarch as if it had been a real acropolis. It is famous for the fountain of Arethusa, connected in Greek legend with the river Alpheus in Peloponnesus.

Till the beginning of the fifth century B.C. our notices of Syracusan history are quite fragmentary. Almost the only question is whether, as some stray notices might suggest, the primitive kingship was retained or renewed at Syracuse, as it certainly was in some other Greek colonies. A king Pollis is spoken of; but nothing is known of his actions. It is far more certain that Syracuse went through the usual revolutions of a Greek city.

The second period of Syracusan history, which roughly begins with the fifth century, is far better ascertained. It is a period of change in every way. The aristocratic commonwealth becomes in turn a tyranny and a democracy; and Syracuse becomes the greatest Greek city in Sicily, the mistress of other cities, the head of a great dominion—for a moment, of the greatest dominion in Hellas. Strange to say, all this growth begins in subjection to the ruler of another city. Hippocrates, tyrant of Gela, held the chief power in eastern Sicily at the beginning of the fifth century B.C. (498-491). He threatened Syracuse as well as other cities, and it was delivered only by the joint intervention of Corinth and Corcyra, and by the cession of the vacant territory of Camarina.

The Athenian siege (415–413) is of the deepest importance for the topography of Syracuse, and it throws some light on the internal politics. Hermocrates, the best of counselors for external affairs, is suspected, and seemingly with reason, of disloyalty to the democratic constitution. Yet he is, like Nicias and Phocion, the official man, head of a board of fifteen generals, which he persuades the people to cut down to three. Athenagoras, the demagogue or opposition speaker, has the best possible exposition of democratic principles put into his mouth by Thucydides (vi. 36–40). Through the whole siege there was a treasonable party within the city, which—for what motive we are not told—kept up a correspondence with the besiegers.

During the long tyranny of Dionysius the city grew greatly in size, population, and grandeur. Plato says that he gathered all Sicily into it. In fact the free Greek cities and communities, in both Sicily and southern Italy, were sacrificed to Syracuse; there the greatness and glory of the Greek world in the West were concentrated. The mass of the population of Gela and Camarina in the disastrous year 405 had at the prompting of Dionysius, taken refuge at Syracuse. Gela had in the previous year received the fugitive inhabitants of Acragas (Agrigentum), which had been sacked by the Carthaginians. Syracuse thus absorbed three of the chief Greek cities of Sicily. It received large accessions from some of the Greek cities of southern Italy, from Hipponium on its west and Caulonia on its east coast, both of which Dionysius captured in 389 B.C. There had also been an influx of free citizens from Rhegium. At the time of the Athenian siege Syracuse consisted of two quarters—the Island and the "outer city" of Thucydides, generally known as Achradina, and bounded by the sea on the north and east, with the adjoining suburb of Apollo Temenites farther inland at the foot of the southern slopes of Epipolæ. With the vast increase in its population, it now grew into a city of four quarters. Each quarter of the city had its own distinct defenses, and Syracuse was now the most splendid and the best fortified of all Greek cities. Its naval power, too, was vastly increased; the docks were enlarged; and 200 new warships were built. Besides the triremes, or vessels with three banks of oars, we hear of quadriremes and quinqueremes with four and five banks of oars—larger and taller and more massive ships than had yet been used in Greek sea warfare. The fleet of Dionysius was the most powerful in the Mediterranean.

Syracuse became in 212 B.C. simply one of the provincial cities of Rome's empire, and its history is henceforward merged in that of Sicily. It retained much of its Greek character and many of its finest public buildings, even after the havoc wrought by Marcellus. Its importance and historic associations naturally marked it out as the residence of the Roman prætor or governor of Sicily. Cicero often speaks of it as a particularly splendid and beautiful city; as still in his own day the seat of art and culture.

Modern Syracuse is confined to the island of Ortygia, and is only about two and one-half miles in circumference. The island is irregularly oval in shape, and extends from north to south on the east side of the fine natural harbor, the Porto Grande (*Magnus Portus*). On the north it is connected with the mainland by a dyke or narrow isthmus, and between the southern extremity and the opposite peninsula of Massolivieri, the ancient Plemmyrium, there is a stretch of 1,300 yards, forming the entrance to the harbor. The approach to the town from the mainland is defended by a dilapidated citadel of the time of Charles V., and the southern extremity is occupied by a castle named after George Maniaces, the last Byzantine general by whom it was held in the eleventh century before it fell into the hands of the Saracens. The town is further defended by walls with bastions. The streets are in general narrow, and their chief feature consists in their numerous convents with wooden-latticed windows. Besides the fortifications, the principal objects of interest are the cathedral of Santa Maria delle Colonne (the ancient temple of Minerva), adjoining which is the archiepiscopal residence; the archæological museum, the finest works preserved in which are a statue of Venus in Parian marble and a colossal head of Zeus; and the fountain of Arethusa, which still bubbles up as clear and abundant as ever on the west side of the island. Its waters, however, are no longer drinkable, an earthquake in 1170 having allowed the sea water to become mingled with them. From the neighborhood of this fountain a favorite promenade extends northward along the shore of the Porto Grande.

Syracuse has been a place of little importance since the year 878, when it was destroyed by the Saracens under Ibrahim ibn Ahmed. Its population in 1881 was 21,157.

SYRACUSE, the county seat of Onondaga county, N. Y., 148 miles west of Albany, midway between that city and Buffalo. Syracuse is situated near the southern end of Onondaga Lake (five miles long by one broad), whose waters flow northward through Seneca and Oswego rivers into Lake Ontario at Oswego. The Erie Canal, flowing east and west, joins the Oswego canal within the city. Syracuse contains several handsome public buildings—the county court-house, the United States Government building, the city-hall, the State asylum for idiots, the Onondaga penitentiary, the county orphan asylum, the asylum of St. Vincent de Paul, the high school (containing the central library of 15,000 volumes), a state armory, etc. Syracuse is the seat of a (Methodist) university, founded in 1870 and consisting of a college of the liberal arts, a college of the fine arts, and a college of physicians and surgeons. The salt industry, to which Syracuse owed much of its early prosperity, is still the staple; the springs situated near the sonthern end of Lake Onondaga, which appears to be the remains of a once very extensive basin, have been under State control since 1797. Previous to the opening of the Michigan springs they were the largest in the United States, and they still yield on an average from 7,000,000 to 8,000,000 bushels of salt per annum. Rolling-mills, furnaces, steel-works, glass-works, breweries, and manufactories of barrels, agricultural machinery, and clothing are among the secondary industrial establishments. At the completion of the Erie Canal in 1825 Syracuse had only 300 inhabitants; by 1855 they were 25,107, and in 1860, 1870, and 1880 respectively they numbered 28,119, 43,051, and 51,792; in 1886 the number had risen to 81,000, and it is now (1890) 88,143.

SYR-DARIA, [Gr. and Lat. *Juxartes;* Arab. *Shash* or *Sihun*), a river flowing into the Sea of Aral, and having a length of 1,500 miles and a drainage area of about 320,000 square miles. Incertitude as to its source prevailed until the recent occupation of Turkestan by the Russians. It has now been traced to the Naryn, which has its sources in the heart of the Tian-Shan complex, some thirty miles south of Lake Issik-kul, in the elevated valleys or *syrts* (12,000 feet) on the southern slope of the Terskei Ala-tau.

SYR-DARIA, or **SYR-DARIINSK**, a province of Russian Turkestan, in Asia, comprising wide tracts of land on both sides of the Syr-Daria river, from its entrance into the Sea of Aral up to Khojend, where it issues from the mountain region of the Tian-Shan. It is bounded on the north by the Russian provinces of Turgai and Akmolinsk, on the east by Semiryetchensk and Ferghana (ex-khanate of Khokand), on the south by the district of Zerafshan, Bokhara, and the Russian province of Amu-daria, and on the west by the sea of Aral. Its area (166,000 square miles), its population (more than one million inhabitants), and its cities (Tashkend, Khojend, Jizak, etc.) make it the most important province of Russian Turkestan; and from its position between the mountain region of Central Asia and the great lake of the west Asian depression it is a region of deep interest for the geographer and geologist.

Syr-Daria is divided into eight districts, the chief towns of which, with their populations in 1881, were—TASHKEND (*q.v.*) (100,000), Aulie-ata (4,450), Jizak (8,700), Kazalinsk (2,950), Khojend (28,000), Perovsk (3,400), Tchemkent (8,050), and Tchinaz (300). Turkestan or Agret (6,700) and Ura-tube (11,000) also deserve mention.

SYRIA. Etymologically, "Syria" is merely an abbreviation of "Assyria," a name which covered the subject-lands of the Assyrian empire, the subject-peoples being also called "Syrians." Afterward, in the Græco-Roman period, the shorter word came to be restricted to the territory west of the Euphrates—the designation "Syrians," however, being given to the great mass of the Semitic populations dwelling between the Tigris and the Mediterranean, who are more accurately called Aramæans.

Syria is the designation of the country which extends for about 380 miles (between 36° 5′ and 31° N. latitude) along the eastern shore of the Mediterranean; its eastern limit, properly speaking, is formed by the middle portion of the course of the Euphrates, but in point of fact it insensibly merges into the steppe country which naturally belongs more or less to Arabia. It is only the oases lying nearest the western border of the steppe (*e.g.*, Aleppo, Palmyra) that can be reckoned as belonging to Syria. From time immemorial the land between Egypt and the Euphrates has been the battlefield for the empires of western Asia on the one hand, and those of Egypt and Africa on the other. It has also been the territory which the trading caravans of these empires have had to traverse; and by its position on the Mediterranean it has been the medium for transmitting the civilizing influences of the East to the West and again of the West to the East. Hence it is easy to understand how the peoples of Syria should only in exceptional cases have played an independent part either in politics or in art and science; none the less on that account is their place in history one of the highest interest and importance.

The surface configuration of the country is a uniform one; the mountains for the most part stretch from north to south in parallel ridges, connecting the Cilician Taurus with the Red Sea range. The continuity is broken for short intervals at one or two points. Immediately connected with the Cilician Taurus in the north, and forming part of it, is the Alma Dagh (ancient Amanus). At its highest it does not rise much above 6,000 feet, but it has an abrupt descent toward the sea, and terminates at its southern extremity in a bold headland, the Rás-el-Khanzír. Here the Orontes reaches the sea through a depression in the chain, and the same outlet forms an important pass into the interior of the country.

To the south of this begins the Lebanon district (see LEBANON); an imaginary line drawn eastward from a point a little to the south of Tyre will represent the southern boundary of what may be designated as middle Syria. Occasionally Syria is spoken of in a narrow sense, as distinguished from Palestine; but there is no scientific ground for such a practice, for the mountains of PALESTINE (*q.v.*), the southern third of Syria, can be described as a southward continuation of the mountain masses already referred to, and cis-Jordanic as well as trans-Jordanic Palestine is simply a portion of Syria. Indeed the district as far as Sinai can be spoken of as a fourth division of the same country. A glance at a geological map reveals this very clearly. Cretaceous limestone constitutes the bulk of the hills and plateaus of Syria, and extends toward Sinai, where the zone of primitive rocks is reached. In the south of Palestine, nummulitic limestone and Nubian sandstone make their appearance from Sinai and northern Arabia. In addition to these, alluvial soils are principally met with. In middle Syria especially, eastward from the upper course of the Jordan, great basaltic masses occur; in the Hauran there are basalt peaks nearly 6,000 feet in height. The basalt mountains are often much broken up so as to be quite inaccessible (Harra); but the basalt when decomposed forms the best of arable soils. It is only in isolated cases that the igneous formation extends into western Syria. The tableland to the east of the principal mountain chains consists partly of good clay soil; the steppe (*bádiyet esh-sham*, also called *Hamád*), which has an average elevation of about 1,800 feet, extends toward the Euphrates with a gradual slope.

The principal river of south Syria is the JORDAN, (*q.v.*) Like it, most of the other streams of Syria rising on the eastern side of the watershed terminate in inland lakes. Of these may be named the El-A'waj and the Barada (Pharpar and Abana) of Damascus, which lose themselves in the lakes and marshes to the east of the city. In like manner the river of Aleppo falls into the lake El-Math.

Two distinct floral regions meet in Syria (comp. LEBANON). That of the coast is Mediterranean, and is characterized by a number of evergreen shrubs, with small leathery leaves, and of quickly flowering spring plants. On the coast of Phœnicia and southward toward Egypt more southern forms of the same vegetation occur, as, for example, *Ficus Sycomorus*, and especially date-palms. This region is separated from the easterly one, that of the steppe flora, by the ridge of Lebanon and the mountains of Palestine. It is distinguished by the variety of its species, by the dry and thorny character of its shrubs, and by its marked poverty in trees. The Jordan valley has on account of its low level a sub-tropical character. As regards cultivated species, Syria is the home of the olive tree, which, like the vine, is found in all parts; but the white mulberry for silk is limited to a small district. Syria is throughout far from unfertile; the district of the Hauran is one magnificent grain-field, while the orchard land about Damascus is renowned far and wide. In former times, however, cultivation was carried on with much greater zeal, and the arrangements for irrigation—a necessity everywhere, especially on the side bordering on the steppe—were much more considerable and more carefully seen to. The numerous ruins on the lands at present under cultivation and still more on those to the east of them indicate that the limits of agriculture were once more extensive and the population much denser than at present. During the Roman period frontier fortresses on the edge of the steppe served to check the rapacity and barbarizing influence of the Bedouin hordes.

Syria presents great diversities of climate. The mountains, though sometimes not absolutely very high, arrest the west winds blowing from the Mediterranean, so that the atmospheric precipitation is much greater on the western than on the eastern slopes. Hence the springs on the eastern versant are fewer, and cultivation is therefore confined to isolated areas resembling oases. The rainfall drains off with great rapidity, the beds of the streams soon drying up again. Within historic times the climate, and with it the productivity of the country, cannot have greatly changed; at most the precipitation may have been greater, the area under wood having been more extensive.

Of the political relations of Syria in ancient times we know but little. Each town with its surrounding district seems to have constituted a small separate state; the conduct of affairs naturally devolved upon the noble families. At a very early period—as early probably as the fifteenth century B.C.—Syria became the meeting place of Egyptian and Babylonian elements, resulting in a type of western Asiatic culture peculiar to itself, which, through the commerce of the Phœnicians, was carried to the western lands of the Mediterranean basin. Something about the ancient political and geographical relations of Syria can be gleaned from Egyptian sources, especially in connection with the campaigns of Thothmes III. in western Asia. The Egyptians designated their eastern neighbors collectively as 'Amu.

The foundation of numerous Greek cities shortly after Alexander's time was of great importance for Syria; ANTIOCH (*q.v.*), founded about 300 B.C. by Seleucus, became the capital of the Syrian kingdom of the Seleucidæ. Among other influential Greek towns were Apamea on the Orontes and Laodicea. The Seleucidæ had severe struggles with the Ptolemies for the possession of the southern part of Syria (comp. ISRAEL).

After having been reckoned for a short time (from 83 to 69 B.C.) among the dominions of Tigranes, king of Armenia, the country was conquered for the Romans by Pompey (64–63 B.C.). It is impossible here to follow in detail the numerous changes in the distribution of the territory and the gradual disappearance of particular dynasties which maintained a footing for some time longer in Chalcis, Abila, Emesa, and Palestine.

The administrative divisions of Syria during the Roman period varied greatly at different times. Through the kingdom of the Nabatæans Roman influence penetrated from Syria far into northern Arabia.

In 616 Syria was subjugated for a brief period by the Persian Chosroes II.; from 622 till 628 it was again Byzantine; 636 and the immediately following years saw its conquest by the Mohammedans (see MOHAMMEDANISM). Mo'áwija, the first Ommayad caliph, chose Damascus for his residence; but in 750 the capital of the empire was removed by the 'Abbásids to Bagdád.

In the crusading period the kingdom of Jerusalem, whose rulers were never able to establish a foothold to the east of the Jordan, extended northward to Beyrout; next it was the countship of Tripoli on the coast; and beyond that in north Syria was the principality of Antioch. Syria suffered severely from the Mongol invasions (1260), and it never recovered its former prosperity. In 1516 the Ottomans took it from the Egyptian Mamelukes.

The religious as well as the ethnographical types are strongly divergent. The bulk of the population is Mohammedan; the Bedouins have not much religion of any kind, but they profess Islam. The Nosairians, and no doubt the Druses also, were originally survivals of the Syrian population. The Jews are found exclusively in the larger centers of population; in every case they have immigrated back from Europe. The Christians are an important element, constituting probably as much as a fifth of the whole population; the majority of them belongs to the Orthodox Greek Church, which has two patriarchs in Syria, at Antioch and Jerusalem. Catholics—United Greeks, United Syrians, and Maronites—are numerous.

Accurate statistics of any kind for Syria cannot be had; even the area of the land under cultivation is unknown. The returns of population are, according to the Turkish official documents, only approximations. The total population may safely be put at less than 2,000,000; an official estimate in 1872–73 gave 1,365,680, of whom 976,322 were Mohammedans. Probably, however, this was an under-estimate. Reclus (*Nouv. Géogr. Univ.* Paris, 1884) gives the area of Syria as 183,000 square kilometers (70,638 square miles) and the population as 1,450,000.

From the Egyptian and Assyrio-Babylonian monuments we learn that in ancient times one of the principal exports of Syria was timber; this has now entirely ceased. But it continues to export wheat, and with good roads the amount could be very largely increased. Other articles of export are silk cocoons, wool, hides, sponges, and fruits (almonds, raisins, and the like); the amounts of cotton, tobacco, and wine sent out of the country are small. The only good harbors are those of Beyrout and Alexandretta (Scanderoon).

SYRIAC LITERATURE. The literature of Syria, as known to us at the present day, is, with the exception of translations from the Greek and some other languages, a Christian literature. The writings of the Syrian heathens, such as the so-called Sābians (see SABIANS) of Harrān, which were extant, at least in part, even in the thirteenth century, seem to have now wholly disappeared. The beginnings of this literature are lost in the darkness of the earliest ages of Christianity. It was at its best from the fourth to the eighth century, and then gradually died away, though it kept up a flickering existence till the fourteenth century or even later. We must own—and it is well to make the confession at the outset—that the literature of Syria is, on the whole, not an attractive one. As Renan said long ago, the characteristic of the Syrians is a certain mediocrity. They shone neither in war, nor in the arts, nor in science. They altogether lacked the poetic fire of the older—we purposely emphasize the word—the older Hebrews and of the Arabs. But they were apt enough as pupils of the Greeks; they assimilated and reproduced, adding little or nothing of their own. Yet to the Syrians belongs the merit of having passed on the lore of ancient Greece to the Arabs, and therefore, as a matter of history, their literature must always possess a certain amount of interest in the eyes of the modern student. The Syrian Church never produced men who rose to the level of a Eusebius, a Gregory Nazianzen, a Basil, and a Chrysostom; but we may still be thankful to the plodding diligence which has preserved for us in fairly good translations many valuable works of Greek fathers which would otherwise have been lost. And even Syria's humble chroniclers, such as John of Ephesus, Dionysius of Tell-Mahrē, and Bar-Hebræus, deserve their meed of praise, seeing that, without their guidance, we should have known far less than we now know about the history of two important branches of the Eastern Church, besides losing much interesting information as to the political events of the periods with which their annals are occupied.

SYZRAN, a district town of Russia, in the government of Simbirsk, lies ninety miles to the south of Simbirsk, a few miles from the Volga. It originated in a fort, erected in 1683, to protect the district from Tartars and Circassians. Most of its inhabitants (24,500) are engaged in gardening and tillage. In the large villages of the surrounding district, one of the richest in Simbirsk, various petty trades are carried on. Syzrañ has long been in repute for its tanneries and manufactures of leather.

SZABADKA (German, *Maria Theresiopel*), a royal free town of Hungary, in the county of Bács, on Lake Palics. It is the center of an immense agricultural district, and has little claim to special distinction. The population was about 63,500 in 1889, mostly Hungarians.

SZARVAS, a town of Hungary, on the Körös, in the county of Békés, is a place noted for the wealth of its peasantry and the excellence of its breed of horses. The population was about 24,000 in 1889, chiefly Slovaks, but all speaking Hungarian.

SZATMÁR-NÉMETI, a royal free town of Hungary, in the county of Szatmár, is situated on the river Szamos, and the Hungarian Northeastern railway. It is the seat of a Roman Catholic bishop and has a seminary, a male and female normal school, and several government offices. The town has a considerable trade in wine and wood. The population numbered 19,708 in 1880, and about 22,000 in 1889.

SZEGEDIN, a royal free city of Hungary, second only to Budapest, is situated on both banks of the Theiss at the influx of the Maros. It is a great center of the commerce and agriculture of the Alföld, has a Roman Catholic gymnasium, a state real school, and a library with about 80,000 volumes. There are a Franciscan, a Piarist, and a Minorite convent, and a large hospital, as well as various government offices, a superior law court, and a chamber of advocates. Szegedin possesses factories of soap, soda, matches, candles, leather, and spirits, steam and saw mills, and salt and tobacco magazines. Szegedin is an important station on the Alföld-Fiume and the Austrian-Hungarian State railways, and is a terminus of the Arad-Csanád railway. The inhabitants in 1880 numbered 73,675, and in 1889 76,600, entirely Magyars.

SZENTES, a market town of Hungary, in the county of Csongrád, on the left bank of the Theiss, thirty miles north of Szegedin. It has a county-hall (1885) and a promenade. The inhabitants are chiefly employed in agriculture, in breeding geese, and in fishing. The population numbered about 30,000 in 1889, all Magyars.

SZIGET (*Mármaros-Sziget*), chief town of the county of Mármaros in the northeast of Hungary, is the center of a salt-mining district, with mining and forestry head departments. The town lies in a valley which abounds in picturesque scenery and is rich in mineral springs. It has a county-hall, Protestant and Catholic gymnasia, a convent, a nunnery, and a training-school for teachers. The population was about 11,200 in 1889.

SZOLNOK, the capital of the county of Jász-Nagy-Kun-Szolnok, Hungary, is situated on the Theiss and the Zagyva, and is the junction of four railways. It carries on a brisk trade in tobacco, salt, and especially in wood. In 1880 the population (Magyars), chiefly Roman Catholics, numbered 18,247, and in 1885 about 19,000.

T.

T is the twentieth symbol in our alphabet. It has varied but little in form since the earliest days when it appeared in Greece and Italy, though some of the Italic alphabets exhibit variants: *e.g.*, in Umbrian and Etruscan inscriptions we find the horizontal stroke sometimes on one side only, and slanting; sometimes the form is nearly that of our ordinary small *t* without the ornamental turn at the bottom. In value it has been in all languages a surd or voiceless dental, corresponding to *d*, which is voiced. But the term "dental" includes some varieties of position, of which the most definite are—(1) where the point of the tongue touches the teeth (true "dental"), as in French; (2) where the tongue touches the gum behind the teeth, and not the teeth at all, as in English; (3) where the point of the tongue is slightly bent back against the palate, producing the sound much heard in South India (often called "cerebral"). T when followed by *i* or *y* is liable to pass into the *s*-sound; this happened in the local dialects of Italy before the Christian era; at Rome the transition was later. This changed sound passed on into the Romance languages, *e.g.*, in French "nation," pronounced "nasion," whence in England it was sounded first as "nasiun" and now as "nashun." Similarly in English *t* followed by *u* undergoes a change of sound; this is due, however, to the old sound of *ū*, viz., long French *u*, or Old English *y*. This long *yy* developed into the *iu* sound heard in "use," "cure," etc.; then the new *i* affected the preceding *t*, and the result is *tsh*, as in "nature" (natshure); similarly *d* in "verdure" is sounded as *dzh* (verdzhure).

English employs the digraph *th* to denote two sounds, differing as voiceless and voiced sounds—the initial sounds of "thin" and "then" respectively. It would be a great convenience if *dh* could be used for the voiced sound, so that "then" should be written "dhen." But it would be even better if the single symbols could be employed to denote these single sounds, as was to some extent the case in the earlier days of our language; in Anglo-Saxon we have the two symbols ð and Þ. The first is only a *d* crossed; the second was a rune and was called "thorn." These, however, were not consistently employed one for the voiceless and one for the voiced sound; also *th* is actually found in the oldest texts, and later on it occurs together with ð and Þ. It is probable that the voiceless sound was originally the only one in Teutonic. It was eventually differentiated into two sounds; but, as is usually the case, writing remained more archaic than speech. In modern English and Icelandic, and probably in the parent Teutonic also, initial *th* is voiceless, except in English in a small number of pronouns and particles in common use, as "thou," "this," "that," "then," "than," "though," "thus;" and it is regularly voiceless when final. The nature of the two sounds is this: the tongue is pressed against the back of the teeth (sometimes, especially when used by foreigners, against the bottom of the upper teeth) and either the breath for *th* or the voice for *dh* is forced through the interstices of the teeth. This pair of sounds is found in modern Greek, where *th* appears as θ and *dh* as δ. In Spanish and in Danish under certain circumstances the sound denoted by *d* is *dh*.

TABARÍ AND EARLY ARAB HISTORIANS. Arabian historians differ from all others in the unique form of their compositions. Each event is related in the words of eye-witnesses or contemporaries transmitted to the final narrator through a chain of intermediate reporters (*ráwís*), each of whom passed on the original report to his successor.

A second type of Arabian historiography is that in which an author combines the different traditions about one occurrence into one continuous narrative, but prefixes a statement as to the lines of authorities used and states which of them he mainly follows. In yet a third type of history the old method is entirely forsaken and we have a continuous narrative only occasionally interrupted by citation of the authority for some particular point. But the principle still is that what has been well said once need not be told again in other words. The writer therefore keeps as close as he can to the letter of his sources, so that quite a late writer often reproduces the very words of the first narrator.

From very early times the Arabs had great delight in verses and tales, and the development of their language was certainly much influenced by this fact. In ancient times story-tellers and singers found their subjects in the doughty deeds of the tribe on its forays, in the merits of horse or camel, in hunting adventures and love complaints, and sometimes in contests with foreign powers and in the impression produced by the wealth and might of the sovereigns of Persia and Constantinople. The appearance of the Prophet with the great changes that ensued, the conquests that made the Arabs—till then a despised race—lords of half the civilized world, supplied a vast store of new matter for relations which men were never weary of hearing and recounting. They wished to know everything about the apostle of God, whose influence on his own time was so enormous, who had accomplished all that seemed impossible and had inspired the Arabs with a courage and confidence that made them stronger than the legions of Byzantium and Ctesiphon. Where could this be better learned than at Medina, where he had lived so long and where the majority of his companions continued to live? So at Medina a school was gradually formed, where the chief part of the traditions about Mohammed and his first successors took a form more or less fixed. Soon divers fathers of Islam began to assist memory by making notes, and their disciples sought to take written jottings of what they had heard from them, which they could carry with them when they returned to their homes. Thus by the close of the first century many *dictata* were already in circulation.

Naturally, then, no independent book of the first century from the Flight has come down to us. But in the second century real books began to be composed. The materials were supplied in the first place by oral tradition, in the second by the *dictata* of older scholars, and finally by various kinds of documents, such as treaties, letters, collections of poetry, and genealogical lists.

The oldest extant history is the biography of the Prophet by Ibn Isḥák (d. 150). This work is generally trustworthy.

The *Life* of the Prophet by Ibn ‘Okba (d. 141), based on the statements of two very trustworthy men, ‘Orwa ibn az-Zobair (d. 94) and Az-Zohrí (d. 124), seems to be quite lost, Sprenger having vainly made every effort to find a copy. It was still much read in Syria in the fourteenth century. But we fortunately possess the *Book of the Campaigns* of the Prophet by Al-Wákidí (d. 207) and the important *Book of Classes* of his disciple Ibn Sa‘d. Wákidí had much more copious materials than Ibn Isḥák, but gives way much more to a popular and sometimes romancing style of treatment. Madáiní's *History of the Caliphs* is the best, if not the oldest, published before Tabarí; but this book has quite disappeared, and is known only by the excerpts given by later writers, particularly Beládhorí, and Tabarí.

Among the contemporaries of Wákidí and Madáiní were Ibn Khidásh (d. 223), the historian of the family Mohallab, whose work was one of Mobarrad's sources for the *History of the Khárijites;* Haitham ibn ‘Adí (d. 207), whose works, though now lost, are often cited; and Saif ibn ‘Omar at-Tamímí, whose book on the revolt of the tribes under Abúbekr and on the Mohammedan conquest was much used by Tabarí.

The third century was far more productive than the second. Abú ‘Obaida was presently succeeded by Ibn al-A‘rábí (d. 231), who in like manner was chiefly famous as a philologist, and who wrote about ancient poems and battles. Much that he wrote is quoted in Tabrízí's commentary on the *Hamása*, which is still richer in extracts from the historical elucidations of early poems given by Ar-Riyáshí (d. 257). Of special fame as a genealogist was Ibn Habíb (d. 245), of whom we have a booklet on Arabian tribal names published by Wüstenfeld (1850). Azrakí again was followed by Fákihí, who wrote a *History of Mecca* in 272, and ‘Omar b. Shabba (d. 262), who composed an excellent history of Basra, known to us only by excerpts. Of the works of Zobair b. Bakkár (d. 256), one of Tabarí's teachers, a learned historian and genealogist much consulted by later writers, there is a fragment in the Köprülü library at Constantinople, and another in Göttingen, part of which has been made known by Wüstenfeld (*Die Familie Al-Zobair*, Göttingen, 1878). Ya‘kúbí or Ibn Wádih wrote a short general history of much value, published by Houtsma (Leyden, 1883). About India he knows more than his predecessors and more than his successors down to Bèrúní. Ibn Khordádbeh's historical works are lost. Ibn ‘Abdalhakam (d. 257) wrote of the conquest of Egypt and the West. Extracts from this book are given by De Slane in his *Historie des Berbères*, and others by Karle and Jones, from which we gather that it was a medley of true tradition and romance, and must be reckoned, with the book of his slightly senior contemporary, the Spaniard Ibn Habíb, to the class of historical romances. A high place must be assigned to the historian Ibn Kotaiba (d. 276), who, as Rosen has well shown, wrote a series of books with a view to raising the scholarship of the large class of *kátibs* or official scribes. To this series belong his very useful *Handbook of History* (ed. Wüstenfeld, Göttingen, 1850) and his ‘*Oyún al-Akhbár*, though the latter book according to the arrangement falls rather under the class of *litteræ humaniores*. Much more eminent is Beládhorí (d. 279), whose book on the Arab conquest (ed. De Goeje, Leyden, 1865-66) merits the special praise given to it by Mas‘údí. Of his great *Ansáb al-Ashráf* a large part exists at Paris in the valuable collection of M. Schefer and another part was published by Ahlwardt in 1884. A contemporary, Ibn abí Táhir Taifúr (d. 280), wrote on the ‘Abbásid caliphs and was drawn on by Tabarí. The sixth part of his work is in the British Museum. Of the universal history of Dínawarí (d. 282), entitled *The Long Narratives*, an edition by Girgas was published in 1887.

All these histories are more or less thrown into the shade by the great work of Tabarí, whose fame has never faded from his own day to ours, and who well deserves to have this article on early Arabic histories placed under his name. His two chief works are a great *Commentary on the Koran* and his *Annals*. Where the same topic comes up in the *Annals* and in the *Commentary* we often find different traditions quoted, or the same tradition derived through different channels, and this shows the copious variety of his sources. Various parts of the *Annals* give the impression of being condensed. The *Commentary* was published before the *Annals*, and is better composed. It is the head corner-stone of Koran exegesis, as the *Annals* are of historiography. It came into general use mainly through the abridgment of Baghawí in the beginning of the sixth century of the Flight, being itself too large to be much read. The great book exists complete in the viceregal library at Cairo, and ought to be published at once.

The *Annals* are a general history from the creation to 302 A.H. They fill some 7,000 to 7,500 pages, one and a half printed pages corresponding roughly to one leaf of Tabarí's original MS. Tabarí added a supplement about his authorities, an abridgment of which follows the Leyden edition. It contains biographical notices of traditionalists, contemporaries of Mohammed, and their successors to the second half of the second century.

The success of the *Annals* and *Commentary* was due above all to the author's personality. The respect paid to him by his contemporaries appears in various anecdotes preserved in his biography. His pupils had an unbounded admiration for his extraordinary knowledge, and what he said seemed to them the best that could be said. In truth, both his great works were the best of their kind, especially the *Commentary*, which, in the judgment of all impartial critics, has not been equaled, before or since, in completeness, learning, and independent judgment. A contemporary says that "it would be worth a journey to China to procure the book." So general was this view that the opinion of Tabarí was quoted as a legal authority.

The inferiority of the *Annals* as a literary composition may be due partly to the author's years, partly to the inequality of his sources, sometimes superabundant, sometimes defective, partly perhaps to the somewhat hasty condensation of his original draft. Nevertheless the value of the book is very great: the author's selection of traditions is usually happy, and the episodes of most importance are treated with most fullness of detail, so that it deserves the high reputation it has enjoyed from the first.

TABERNACLE, the portable sanctuary of Israel in the wilderness wanderings. Critical analysis of the PENTATEUCH (*q.v.*) teaches us to draw a sharp line between the old notices of the tabernacle contained in the pre-Deuteronomic history book (JE) and the account given by the post-exilic priestly narrator. The latter throws back into the time of Moses the whole scheme of worship and ritual of which the second temple was the center, and, as this scheme necessarily implies the existence of an elaborate sanctuary on the pattern of the temple, he describes a tabernacle of extraordinary splendor pitched in the middle of the camp, with an outer and inner chamber and a court-yard, and all the apparatus of sacrificial and atoning ritual, just as in the temple, only constructed of boards, posts, and curtains so that it could be taken down and moved from place to place. The whole description is ideal, as appears not only from the details but from the fact that the old history knows nothing of such a structure. The Chronicler indeed, who had before him the Pentateuch in its present shape, assumes that after the Israelites entered Canaan the tabernacle continued to be the one legitimate place of sacrifice until it was superseded by Solomon's temple, and represents it as standing at Gibeon in the days of David and his son (1 Chron. xxi. 29 *seq.*; 2 Chron. i. 3). But the book of Kings knows Gibeon only as "the greatest high place" (1 Kings iii. 4).

Again, the tabernacle of the Priestly Code is preeminently the sanctuary of the ark, bearing the name *mishkan hā'ēdūth*, "the tabernacle of the testimony," *i.e.*, the habitation in which lay "the ark of the testimony" or chest containing the stones on which the decalogue was inscribed. But between Joshua's days and the building of the temple the ark migrated from one tent or habitation to another (2 Sam. vii. 6; 1 Chron. xvii. 5), and at Shiloh it was housed not in a tent but in a temple (1 Sam. iii. 3, 15). And, while in the Priestly Code the tabernacle is the only legitimate sanctuary and its priests are the only legitimate priests, the whole history shows that no such restriction was even thought of till after the time of the prophet Isaiah.

TABERNACLES, FEAST OF. The original character of this Hebrew feast, celebrated at the close of the agricultural year as a thanksgiving for the produce of the seasons, but especially for the vintage and olive harvest, is described in the old law of Exod. xxiii. 16, under the name of "the feast of ingathering, at the end of the year" (which in the old Hebrew calendar, ran from autumn to autumn), "when thou hast gathered in thy labours out of the field" (comp. Exod. xxxiv. 22). The same feast is spoken of in Deut. xvi. 13 as "the feast of booths" (E.V. "tabernacles," whence the current name of the feast), when "thou hast gathered in thy corn and wine" from the corn-floor and the winepress. No explanation is here given of the name "feast of booths;" but after the exile it was understood that during this feast the people assembled at Jerusalem were to live in booths constructed of branches of trees (Lev. xxiii. 39 *seq.;* Neh. viii. 14 *seq*). The passage in Nehemiah, describing the celebration of the feast in 444 B.C., serves as a commentary on the post-exilic law in Leviticus, and from it we learn that the use of booths on that occasion had no foundation in traditional usage, but was based directly on the law, which then for the first time became generally known. According to the law in question, the booths were to be a memorial of the wilderness wandering (Lev. xxiii. 43), but of this there is no hint in Deuteronomy; and, while it is quite in the style of the latter law to attach a new historical reference to an old name like "feast of booths," it is certain from Exodus that the feast had originally agricultural and not historical significance. As such it is exactly parallel to the vintage feasts of other ancient nations.

TABLES, MATHEMATICAL. In any table the results tabulated are termed the "tabular results" or "respondents," and the corresponding numbers by which the table is entered are termed the "arguments." A table is said to be of single or double entry according as there are one or two arguments. For example, a table of logarithms is a table of single entry, the numbers being the arguments and the logarithms the tabular results; an ordinary multiplication table is a table of double entry, giving xy as tabular result for x and y as arguments. The intrinsic value of a table may be estimated by the actual amount of time saved by consulting it; for example, a table of square roots to ten decimals is more valuable than a table of squares, as the extraction of the root would occupy more time than the multiplication of the number by itself. The value of a table does not depend upon the difficulty of calculating it; for, once made, it is made forever, and as far as the user is concerned the amount of labor devoted to its original construction is immaterial. In some tables the labor required in the construction is the same as if all the tabular results had been calculated separately; but in the majority of instances a table can be formed by expeditious methods which are inapplicable to the calculation of an individual result. This is the case with tables of a continuous quantity, which may frequently be constructed by differences. The most striking instance perhaps is afforded by a factor table or a table of primes; for, if it is required to determine whether a given number is prime or not, the only available method (in the absence of tables) is to divide it by every prime less than its square root or until one is found that divides it without remainder. But to form a table of prime numbers the process is theoretically simple and rapid, for we have only to range all the numbers in a line and strike out every second beginning from two, every third beginning from three, and so on, those that remain being primes. Even when the tabular results are constructed separately, the method of differences or other methods connecting together different tabular results may afford valuable verifications. By having recourse to tables not only does the computer save time and labor but he also obtains the certainty of accuracy; in fact, even when the tabular results are so easy to calculate that no time or mental effort would be saved by the use of a table, the certainty of accuracy might make it advantageous to employ it.

The invention of logarithms, in 1614, followed immediately by the calculation of logarithmic tables, revolutionized all the methods of calculation; and the original work performed by Briggs and Vlacq in calculating logarithms 260 years ago has in effect formed a portion of every arithmetical operation that has since been carried out by means of logarithms. And not only has an incredible amount of labor been saved but a vast number of calculations and researches have been rendered practicable which otherwise would have been quite beyond human reach. The mathematical process that underlies the tabular method of obtaining a result may be indirect and complicated; for example, the logarithmic method would be quite unsuitable for the multiplication of two numbers if the logarithms had to be calculated specially for the purpose and were not already tabulated for use. The arrangement of a table on the page and all typographical details—such as the shape of the figures, their spacing, the thickness and placing of the rules, the color and quality of the paper, etc.—are of the highest importance, as the computer has to spend hours with his eyes fixed upon the book; and the efforts of eye and brain required in finding the right numbers amidst a mass of figures on a page and in taking them out accurately, when the computer is tired as well as when he is fresh, are far more trying than the mechanical action of simple reading. Moreover, the trouble required by the computer to *learn* the use of a table need scarcely be considered; the important matter is the time and labor saved by it after he has learned its use. Tables are, as a rule, intended for professional and not amateur use; and it is of little moment whether the user who is unfamiliar with a table has to spend ten seconds or a minute in obtaining an isolated result, provided it can be used rapidly and without risk of error by a skilled computer.

The mathematical tables most frequently used are the multiplication, addition, and subtraction tables. In addition to these there are others for more complex operations, some of which would be very difficult without their aid. Among them may be mentioned tables for factors and primes, squares, cubes, triangular numbers, reciprocals, common fractions, sexagesimal and sextenary calculations, trigonometry, logarithms of various kinds, anti-logarithms, constants, irreducible cubic equations, coefficients, quadratic surds, etc. For the uses of each table here enumerated the reader is referred to any standard work on mathematics.

TABOO (also written TABU and TAPU) is the name given to a system of religious prohibitions which attained its fullest development in Polynesia (from Hawaii to New Zealand); but of which under different names traces may be discovered in most parts of the world.

The word "taboo" is common to the different dialects of Polynesia, and is perhaps derived from *ta*, "to mark," and *pu*, an adverb of intensity. The compound word "taboo" (tapu) would thus originally mean, "marked thoroughly." Its ordinary sense is "sacred." It does not, however, imply any moral quality, but only "a connection with the gods or a separation from ordinary purposes and exclusive appropriation to persons or things considered sacred; sometimes it means devoted as by a vow." Chiefs who trace their lineage to the gods are called *arii tabu*, "chiefs sacred." And a temple is called a *wahi tabu*, "place sacred." The converse of taboo is *noa* (in Tonga *gnofoóa*), which means "general" or "common." Thus the rule which forbade women to eat with men, as well as, except on special occasions, to eat any fruits or animals offered in sacrifice to the gods, was called *ai tabu*, "eating sacred;" while the present relaxation of the rule is called *ai noa*, eating generally, or having food in common. Although it was employed for civil as well as religious purposes, the taboo was essentially a religious observance. In Hawaii it could be imposed only by priests; but elsewhere in Polynesia kings and chiefs, and even to a certain extent ordinary individuals, exercised the same power. The strictness with which the taboo was observed depended largely on the influence of the person who imposed it; if he was a great chief it would not be broken; but a powerful man often set at nought the taboo of an inferior.

A taboo might be general or particular, permanent or temporary. A general taboo applied, *e.g.*, to a whole class of animals; a particular taboo was confined to one or more individuals of the class.

Certain foods were permanently taboo to (*i.e.*, in favor of or for the use of) gods and men, but were forbidden to women. Thus in Hawaii the flesh of hogs, fowls, turtle, and several kinds of fish, cocoa-nuts, and nearly everything offered in sacrifice were reserved for gods and men, and could not, except in special cases, be consumed by women. Sometimes certain fruits, animals, and fish were taboo for months together from both men and women. If an island or a district was tabooed, no canoe or person might approach it while the taboo lasted; if a path was tabooed, no one might walk on it. Seasons generally kept taboo were the approach of a great religious ceremony, the time of preparation for war, and the sickness of chiefs.

The penalty for the violation of a taboo was either religious or civil. The religious penalty inflicted by the offended *atuas* or spirits generally took the form of a disease: the offender swelled up and died, the notion being that the *atua* or his emissary (often an infant spirit) had entered into him and devoured his vitals. Cases are on record in which persons who had unwittingly broken a taboo actually died of terror on discovering their fatal error. Chiefs and priests, however, could in the case of involuntary transgressions perform certain mystical ceremonies which prevented this penalty from taking effect. The civil penalty for breaking a taboo varied in severity. In Hawaii there were police officers appointed by the king to see that the taboo was observed, and every breach of it was punished with death, unless the offender had powerful friends in the persons of priests or chiefs. Elsewhere the punishment was milder.

Besides the permanent and the artificially created taboos there were others which arose spontaneously as a result of circumstances. Thus all persons dangerously ill were taboo and were removed from their houses to sheds in the bush; if they remained in the house and died there the house was tabooed and deserted. Mothers after childbirth were taboo, and so were their new-born children. Women before marriage were *noa*, and could have as many lovers as they chose; but after marriage they were strictly tabooed to their husbands and from every one else. One of the strictest taboos was incurred by all persons who handled the body or bones of a dead person or assisted at his funeral.

There were various ceremonies by which a taboo could be removed. In Tonga a person who had become taboo by touching a chief or anything belonging to him could not feed himself till he had got rid of the taboo by touching the soles of a superior chief's feet with his hands and then rinsing his hands in water, or (if water was scarce) rubbing them with the juice of the plaintain or banana. But, if a man found that he had already (unknowingly) eaten with tabooed hands, he sat down before a chief, took up the foot of the latter, and pressed it against his stomach to counteract the effect of the food inside. In New Zealand a taboo could be taken off by a child or grandchild. The tabooed person touched the child and took drink or food from its hands; the man was then free, but the child was tabooed for the rest of the day.

Besides the taboos already described there were others which any one could impose. In New Zealand, if a man wished to preserve his house, crop, garden, or anything else, he made it taboo; similarly he could appropriate a forest tree or a piece of drift timber, etc., by tying a mark to it or giving it a chop with his ax. In Samoa for a similar purpose a man would set up a representation of, *e.g.*, a sea pike or a shark, believing that any one who meddled with property thus protected would be killed by a sea pike or shark, the next time he bathed. Somewhat similiar to this was what may be called the village taboo. In the autumn the *kumera* (sweet potato) fields belonging to the village were taboo till the crop was gathered, so that no stranger could approach them; and all persons engaged in getting in the crop were taboo, and could therefore for the time engage in no other occupation. Similar taboos were laid on woods during the hunting season and on rivers during the fishing season.

The original character of the taboo must be looked for not in its civil but in its religious element. It was not the creation of a legislator but the gradual outgrowth of animistic beliefs, to which the ambition and avarice of chiefs and priests afterward gave an artificial extension. But in serving the cause of avarice and ambition it subserved the progress of civilization, by fostering conceptions of the rights of property and the sanctity of the marriage tie—conceptions which in time grew strong enough to stand by themselves and to fling away the crutch of superstition which in earlier days had been their sole support. For we shall scarcely err in believing that even in advanced societies the moral sentiments, in so far as they are merely sentiments and are not based on an induction from experience, derive much of their force from an original system of taboo. Thus on the taboo were grafted the golden fruits of law and morality, while the parent stem dwindled slowly into the sour crabs and empty husks of popular superstition on which the swine of modern society are still content to feed.

TABRÍZ, TAVRIS, or TAVRIZ, a town of Persia, capital of the province of Adarbaiján (Azarbijan, ancient Atropatene), is situated in 38° 4′ N. latitude and 46° 18′ E. longitude, more than 4,000 feet above the sea, at the eastern end of a wide valley, through which runs a river whose waters irrigate the gardens that encircle the town. General Schindler estimated the population in 1886 at about 170,000—a number agreeing with the latest local census. The same authority states that the city contains 8 tombs of imámzádehs, 318 mosques, 100 public baths, 166 caravanserais, 3,922 shops, 28 guard-houses, and 5 Christian (Armenian) churches; but this account must comprise in some of its items more buildings than are actually in use. There are said to be nearly 3,000 Armenians in the place.

TACITUS. The famous Roman historian Tacitus, who ranks beyond dispute in the highest place among men of letters of all ages, lived in the latter half of the first and in the early part of the second century of our era, through the reigns of the emperors Nero, Galba, Otho, Vitellius, Vespasian, Titus, Domitian, Nerva, Trajan. All we know of his personal history is from allusions to himself in his own works, and from eleven letters addressed to him by his very intimate friend the younger Pliny. The exact year of his birth is a matter of inference, but it may be approximately fixed near the close of the reign of Claudius, from 52 to 54 A.D. The most interesting facts about him to us are that he was an eminent pleader at the Roman bar, that he was an eyewitness of the "reign of terror" during the last three years of Domitian, and that he was the son-in-law of the great and good Julius Agricola, the humane and enlightened governor of Britain. With the emperor Nerva's accession his life became bright and prosperous, and so it continued through the reign of Nerva's successor, Trajan, he himself, in the opening passage of his *Agricola*, describing this as a "singularly blessed time" (*beatissimum seculum*); but the hideous reign of terror preceding this had stamped itself ineffaceably on his soul, and when he sat down to write his *History* he could see little but the darkest side of imperialism. He was advanced to the consulship in 97, in succession to a highly distinguished man, Virginius Rufus, on whom he delivered in the senate a funeral eulogy. In 99 he was associated with Pliny in the prosecution of a great political offender, Marius Priscus, under whom the provincials of Africa had suffered grievous wrongs. The prosecution was successful. Of his remaining years we know nothing, and we may presume that he devoted them exclusively to literary work. It would seem that he lived to the close of Trajan's reign, as he seems to hint at that emperor's extension of the empire by his successful Eastern campaigns from 115 to 117. Whether he outlived Trajan is matter of conjecture.

TACITUS, M. CLAUDIUS, Roman emperor from September 25, 275, to April, 276, was a native of Interamna (Terni) in Umbria, and was born about the year 200. In the course of his long life he discharged the duties of various civil offices, including that of consul in 273, with universal respect. Six months after the assassination of Aurelian he was chosen by the senate to succeed him, and the choice was cordially ratified by the army. During his brief reign he set on foot some domestic reforms, and sought to revive the authority of the senate, but, after a victory over the Alani near the Palus Mæotis, he succumbed to the hardships and fatigues of his new duties at Tyana in Cappadocia.

TACOMA, the county seat of Pierce county, Wash., is a city the remarkable growth and development of which have served to place it in the front rank of western municipalities, and make it the objective point for men of enterprise and capital. The "City of Destiny," as it has been named, is situated at the head of navigation on Puget Sound, at the junction of the Pacific and Cascade divisions of the Northern Pacific road, and is the southern terminus of the Oregon Railway and Navigation Company's line of steamers to Victoria, B. C. In addition to these, a line of Pacific coast steamers is operated between Tacoma and San Francisco, and the city is in direct communication by lines of vessels with Europe and South America, thus completing a system of transportation facilities of unrivaled value and importance. As an indication of the city's growth within the past ten years, it may be stated that the assessed value of property has risen from $517,627 in 1880 to $6,555,433 in 1888 and to $19,240,441 in 1889. In the latter year the wholesale business mounted up to $9,000,000 in value and the manufacturing products to nearly $12,000,000. The city is picturesquely situated almost at the base of the Olympic and Cascade Mountains, in the natural course of trade around the globe; in the center of a country teeming with the wealth of its agricultural, lumber, and mining resources, possessing a mild equable climate and many other inducements for future greatness. The city now contains ten national and other banks with a combined cash capital of $1,680,000, the surplus amounting to $331,693.83 and deposits aggregating $3,248,573.08, besides a number of other financial institutions, including a clearing house, the business of which for the year 1889 footed up $25,086,677.82. There are two daily and two weekly papers issued, the educational and religious interests are well maintained and the manufacturing industries represent a total of $5,394,300 capital invested, give employment to 4,420 men at a total monthly compensation of $270,525, and annually turn out products valued at $13,356,840. The city also contains a number of hotels, an opera house, public halls, etc., supports well organized police and fire departments, has thirty-two miles of sewer, forty-one miles of improved streets, thirteen miles of an electric railway system and sixteen miles of track in addition devoted to urban and suburban traffic. Gas and electricity are both employed in lighting the city, and an abundance of pure water is supplied by works completed during the summer of 1890. The population is 36,006. The assessed value of property in the city for the year 1890 was $30,000,000, and the city tax twelve mills. The city is practically free from debt.

TACTICS. See WAR.

TADMOR. See PALMYRA.

TAFILELT, a large oasis in Morocco. The principal place is Abuam.

TAGANROG, a seaport of southern Russia, on the northern shore of the Sea of Azoff, in the government of Ekaterinoslaff, and nearly 200 miles southeast of its chief town. Its commercial importance dates from the second half of the present century; in 1870 its population had risen to 38,000, and after it had been brought into railway connection with Kharkoff and Voronezh, and thus with the fertile provinces of south and south east Russia, the increase was still more rapid, the number reaching 63,025 in 1882—Greeks, Jews, Armenians, and West-Europeans being important elements. Notwithstanding the disadvantages of its open roadstead, the foreign trade of Taganrog rapidly expanded, the annual value of the exports having recently reached $12,500,000.

TAGLIACOZZI, Gasparo, a surgeon of wide repute, was born at Bologna in 1546, and studied at that university under Cardan, taking his degree in philosophy and medicine at the age of twenty-four. He was appointed professor of surgery and afterward of anatomy, and achieved notoriety, at least, and the fame of a wonder worker. He died at Bologna on November 7, 1599.

TAGLIONI, Marie, a ballet dancer, was the daughter of Filippo Taglioni, an Italian master of the ballet, and was born at Stockholm April 23, 1809. In 1832 she married Comte Gilbert de Voisins, by whom she had two children. Losing her savings in speculation, she afterward supported herself in London as a teacher of deportment, especially in connection with the ceremony of presentation at court. During the last two years of her life she stayed with her son at Marseilles, where she died in April, 1884.

TAGUS (Span. *Tajo*, Portug. *Tejo*), the longest river of the Iberian Peninsula. Its length is 566 miles, of which 192 are on or within the frontier of Portugal, and the area of its basin, according to Strelbitsky, is 31,864 square miles. It empties into the Bay of Lisbon.

TAHITI ARCHIPELAGO. The Eastern Polynesian island-group generally known as the Society Islands (*Isles de la Société* or *Taïti*) lies between 16° and 18° S. latitude and 148° and 155° W. longitude, and stretches for nearly 200 miles in a northwest and southeast direction; the total area does not exceed 650 square miles, of which 600 fall to Tahiti alone.

Tahiti occupies a central position in the Pacific. Sydney lies about 3,400 miles to the west and San Francisco about as far to the north-northeast. Honolulu, Noumea, and Auckland are each somewhere about 2,400 miles away; Panama is at a distance of 4,600 miles.

The archipelago consists of eleven islands, which are divided into two clusters—the Leeward and the Windward Islands—by a clear channel of sixty miles in breadth. The Leeward Islands, to which alone the name of Society Islands was given by Cook, are Tubai or Motu-iti, a small uninhabited lagoon island, the most northern of the whole archipelago; Maupiti or Mau-rua —"Double Mountain," the most western; Bora-bora (Bola-Bola of the older navigators), or Fáarui; Tahaa; Raiatea or Ulietea (Boenshea's Princessa) the largest island of this cluster, and Huahine, which approach each other very closely, and are encircled by one reef. To the Windward Islands, the Georgian Islands of the early missionaries, belong Maiaiti or Tapamanu (Wallis' Sir Charles Saunders Island and Boenshea's Pelada); Morea or Eimeo (Wallis' Duke of York Island and Boenshea's San Domingo); Tahiti—Cook's Otaheiti (probably Quiros' Sagittaria; Wallis' King George's Island, Bougainville's Nouvelle Cythère, and Boenshea's Isla d'Amat), the most southern and by far the largest of all the islands; Tetuara or Tetiaroa—"The Distant Sea" (?Quiros' Fugitiva; Bougainville's Umaitia and Boenshea's Tres Hermanos); and Matia or Maitea (?Quiros' La Dezana, Wallis' Osnaburg Island, Bougainville's Boudoir and Pic de la Boudeuse, and Boenshea's San Cristoval), which is by a degree the most eastern of the archipelago. Bellinghausen, Scilly, and Lord Howe (Mopia) are three insignificant clusters of coral islets to the northwest and west, and, like Tubai and Tetuara, are atolls. The length of the Tetuara reef ring is about six miles; it bears ten palm-covered islets, of which several are inhabited, and has one narrow boat-passage leading into the lagoon. With the exception just named, the islands, which agree very closely in geological structure, are mountainous, and present perhaps the most wonderful example of volcanic rocks to be found on the globe. They are formed of trachyte, dolerite, and basalt. There are raised coral beds high up the mountains, and lava occurs in a variety of forms, even in solid flows; but all active volcanic agency has so long ceased that the craters have been almost entirely obliterated by denudation. Hot springs are unknown, and earthquakes are slight and rare.

All voyagers agree that for varied beauty of form and color the Society Islands are unsurpassed in the Pacific. Innumerable rills, fed by the fleeting clouds which circle round the high lands, gather in lovely streams, and, after heavy rains, torrents precipitate themselves in grand cascades from the mountain cliffs—a feature so striking as to have attracted the attention of all voyagers, from Wallis downward. Round most of the islands there is a luxuriant coral growth; but, as the reefs lie at no great distance, and follow the line of the coast, the inter-island channels are safer than those of the neighboring Tuamotus, which exhibit the atoll formation in perhaps its fullest development, and in consequence have been justly called the "Low" or "Dangerous Archipelago." Maitea, which rises from the sea as an exceedingly abrupt cone, and Tapamanu appear to be the only islands which have not their fringing and more or less completely encircling barrier-reefs. The coasts are fairly indented, and, protected by these reefs, which often support a chain of green islets, afford many good harbors and safe anchorages. In this respect the Society Islands have the advantage of most of the Polynesian groups.

The island of Tahiti, in shape not unlike the figure eight, has a total length of thirty-five miles, a coastline of 120, and a superficial area of 600 square miles. By the last census the population of the entire island was 9,194, one-eighth being French and foreigners. The majority of the natives profess the Protestant religion.

There is little doubt that the main island and some other members of the group were visited by the Spaniard Pedro Fernandez de Quiros in February, 1607. They were rediscovered in June, 1767, by Wallis in the *Dolphin*, who took nominal possession of Tahiti for George III. and named it after him. In the following year Bougainville visited Tahiti, claimed it as French, and called it La Nouvelle Cythère. With Tetuara (called by him Umaitia) and Eimeo it makes up the Archipel de Bourbon of his most inaccurate chart. Almost all we know of the early state of the islands is, however, due to Captain Cook's visits in 1769, 1773, 1774, and 1777. The name of Society Islands was given to the Leeward group on his first voyage in honor of the Royal Society. In 1774 Tahiti was also visited by two Spanish vessels, which left two priests, who remained for ten months on the island. The Spaniards named it Isla d'Amat. The islands were again visited in 1788 by the *Lady Penrhyn*. Bligh in the *Bounty* spent five months on the island in the same same year, and it was revisited by that ship after the famous mutiny. At this time the leading chief was Pomare, whose family had been preëminent in the island for more than a century. Aided by sixteen of the *Bounty* mutineers, and armed with guns procured from Bligh and a Swedish vessel, Pomare greatly strengthened his power and brought to a successful close a long struggle with Eimeo. In 1791 the *Pandora* carried off fourteen of the *Bounty* mutineers, and from this time forward visits were frequent.

In 1838 a French frigate appeared, under the command of M. du Petit-Thouars, and extorted from Pomare the right of settlement for Frenchmen of every profession. Other acts of interference followed, and, at length, in 1842, Admiral du Petit-Thouars procured the signature of a document placing the islands under French protection, the authority of the queen and chiefs being expressly reserved. In 1843 Petit-Thouars reappeared, and, alleging that the treaty of 1842 had not been duly carried out, deposed the queen and took possession of the islands. His high-handed action was not countenanced by the French government, but, while it professed not to sanction the annexation, it did not retrace the steps taken. Two years were spent in reducing the party in the islands opposed to French rule; an attempt to conquer the western islands failed; and at length, by agreement with England, France promised to return to the plan of a protectorate and leave the western islands to their rightful owners. In 1880 Tahiti, including Eimeo, was proclaimed a French colony. It is the residence of the governor-general of the French dependencies in the Pacific.

TAIWAN. See FORMOSA.

TAJAK, TAJIK, or TAUSIK, a term originally occurring in the Pahlavi writings, and explained to mean, first, the Arabs in general, then their descendants born in Persia and elsewhere out of Arabia, and lastly the Persians in general and their descendants born in Turkestán and elsewhere out of Persia. Tajak has thus come to be the collective name of all communities of Iranian stock and Persian speech, wherever found in Central Asia.

TAJ MAHAL, the most ornate and beautiful piece of monumental architecture in the world, is situated just outside the walls of the city of Agra. It was built by the Emperor Shah Jehan as a mausoleum for himself and his favorite wife and is built of white marble and lavishly decorated with mosaic work. Twenty thousand men were employed upon it for over twenty years.

TALAVERA DE LA REINA, a town of Spain in the province of Toledo, is situated on the right bank of the Tagus, and on the railway from Madrid to Caceres, some forty miles below Toledo and sixty-four miles southeast from Madrid. The population within the municipal limits in 1887 was 12,000.

TALBOT, FAMILY OF. Apart from its achievements, this is one of the few families in the English aristocracy which traces alike its descent and its surname from the Norman conquerors of England; and it may really be said that there has hardly been a time during the last eight hundred years in which the Talbots have not been of considerable account in public life. The name of Richard Talbot occurs in Domesday Book as the holder of nine hides of land in Bedfordshire under Walter Giffard earl of Buckingham. His son Geoffrey Talbot took part with the empress Maud against King Stephen. But apparently it was another son Hugh who continued the line. His son Richard obtained from Henry II. the lordship of Linton in Herefordshire, and from Richard I. the custody of Ludlow castle; and his descendants for some generations appear to have been wardens of various castles on the borders of Wales. Under Edward II. a Gilbert Talbot was head of the house.

His son Richard, who had married a daughter of John Comyn of Badenoch, laid claim to certain lands in Scotland in her right, and, when restrained from entering that country by land (Edward III. having then made an alliance with King David), he joined in a successful expedition which invaded it by sea in the interests of Edward Baliol. Another Gilbert Talbot, grandson of the last, claimed to carry the great spurs at the coronation of Henry V., and had a commission to receive the submission of Owen Glendower and his adherents.

Hitherto the head of the house had borne the name of Lord Talbot; but this John, after obtaining by marriage the title of Lord Furnivall, was for his distinguished actions created earl of Shrewsbury. He died in 1453. His son John, Viscount Lisle, was slain along with him in the same fatal battle.

John, the second earl of Shrewsbury, was the first earl's son by his first wife. He had been knighted at Leicester in 1426 along with the infant king Henry VI., had served in the wars of France, and been made chancellor of Ireland during his father's lifetime, when he was only Lord Talbot. His son John succeeded him, and then his grandson George, who fought for Henry VII. at Stoke, and whom King Henry VIII. sent as his lieutenant against the rebels in that most formidable insurrection, the Pilgrimage of Grace.

Francis, the fifth earl, took a leading part in the invasions of Scotland under Henry VIII. and Edward VI. His son George, who succeeded, was the earl to whom the custody of Mary Stuart was committed. Two sons of this last earl succeeded one another, and the title then devolved, for want of male issue, on the lineal descendants of Sir Gilbert Talbot of Grafton in Worcestershire, third son of John, the second earl.

The ninth earl, George, descended from this Gilbert, is not distinguished by any prominent actions. He died unmarried, and his brother, who followed next, was succeeded by his grandson Francis, chiefly memorable for his unhappy fate. His second wife, a daughter of the earl of Cardigan, was seduced by the duke of Buckingham, whom the outraged husband challenged to a duel. The countess, it is said, was present at the scene, and held Buckingham's horse in the disguise of a page, saw her husband killed, and then clasped her lover in her arms, receiving blood-stains upon her dress from the embrace. Charles, the twelfth earl, son of this unfortunate nobleman, was raised by William III. to the dignity of a duke for his important diplomatic services.

From this time the direct line of Sir Gilbert Talbot of Grafton began to fail. A nephew three times succeeded to an uncle, and then the title devolved upon a cousin, who died unmarried in 1856. On the death of this cousin the descent of the title was for a short time in dispute, and the lands were claimed for the infant son of the duke of Norfolk under the will of the last earl; but the courts decided that, under a private Act obtained by the duke of Shrewsbury in the sixth year of George I., the title and estates must go together, and the true successor to the earldom was found in Earl Talbot, the head of another line of the descendants of Sir Gilbert Talbot of Grafton, sprung from a second marriage of Sir Gilbert's son, Sir John Talbot of Albrighton.

The Earl Talbot who successfully claimed the Shrewsbury title (as the eighteenth earl) was the present earl's grandfather, and all the titles just mentioned have been united in his line ever since.

TALBOT, WILLIAM HENRY FOX, a discoverer in photography, was born in February, 1800, and educated at Harrow and at Trinity College, Cambridge. At an early period he had begun his optical researches, which were to have such important results in connection with photography. In 1841 he made known his discovery of the calotype process, but after the discovery of the collodion process by Scott Archer, with whom he had a lawsuit in reference to his patent rights, he relinquished this field of inquiry. For his discoveries, the narrative of which is detailed in his *Pencil of Nature* (1844), he received in 1842 the medal of the Royal Society. He was also an enthusiastic archæologist. With Sir Henry Rawlinson and Doctor Hincks he shares the honor of having been one of the first decipherers of the cuneiform inscriptions of Nineveh. He was also the author of *English Etymologies* (1846). He died at Laycock Abbey, September 17, 1877.

TALC. See MINERALOGY.

TALCA, a town of Chili, capital of the province of Talca, is situated on the Claro, a tributary of the Maule, nearly due south of Santiago, with which it is connected by rail. The town has a lyceum and some woolen manufactures (especially of "ponchos"). In 1875 the population numbered 17,496, and in 1885 about 19,000.

TALENT. A Phœnician weight or coin.

TALES are, in the usual acceptance of the word, fictitious narratives, long or short, ancient or modern. In this article "tale" is used in a stricter sense, as equivalent to the German "Volks-märchen" or the French "conte populaire." Thus understood, popular tales mean the stories handed down by oral tradition from an unknown antiquity, among savage and civilized peoples. So understood, popular tales are a subject in mythology, and indeed in the general study of the development of man, of which the full interest and importance is scarcely yet recognized. Popular tales won their way into literature, it is true, at a very distant period. The Homeric epics, especially the *Odyssey*, contain adventures which are manifestly parts of the general human stock of popular narrative. Other examples are found in the *Rigveda*, and in the myths which were handled by the Greek dramatists. Collections of popular tales, more or less subjected to conscious literary treatment, are found in Sanskrit, as in the work of Somadeva, whose *Kathá Sarit Ságara*, or "Ocean of the Streams of Story," has been translated by Mr. Tawney (Calcutta, 1880). The *Thousand and One Nights* (*q.v.*) are full of popular tales, and popular tales are the staple of the mediæval *Gesta Romanorum*, and of the collections of Straparola and other Italian conteurs. In all these and similar gatherings the story, long circulated from mouth to mouth among the people, is handled with conscious art, and little but the general outline of plot and character of incident can be regarded as original. In the *Histoires ou Contes du Temps Passé* of Perrault (Elzevir, Amsterdam, 1697; the Parisian edition is of the same date) we have one of the earliest gatherings of tales which were taken down in their nursery shape as they were told by nurses to children. This at least seems probable, though M. Alfred Maury thinks Perrault drew from literary sources. Perrault attributed the composition to his son, P. Darmaucour, at that time a child, and this pretext enabled him to give his stories in a simple and almost popular guise. It seems that popular tales in many cases probably owe their origin to the desire of enforcing a moral or practical lesson.

The success of Perrault's popular tales brought the genre into literary fashion, and the Comtesse d'Aulnoy invented, or in some cases adapted, "contes," which still retain a great popularity. But the precise and scientific collection of tales from the lips of the people is not much earlier than our century. The chief impulse to the study was given by the brothers Grimm. The first edition of their *Kinder-und Haus-Märchen* was published in 1812. The English reader will find a very considerable bibliography of popular tales, as known to the Grimms, in Mrs. Alfred Hunt's translation, *Grimm's Household Tales, with Notes* (London, 1884). Since the Grimms' time our knowledge of the popular tales of non-European races has been greatly enriched. We possess numbers of North American, Brazilian, Zulu, Swahili, Eskimo, Samoan, Maori, Kaffir, Malagasy, Bushman, and even Australian märchen, and can study them in comparison with the stories of Hesse, of the West Highlands of Scotland, of Scandinavia.

While the popular romances of races of all colors must be examined together, another element in this subject is not less important. It had probably been often observed before, but the fact was brought out most vividly by Von Hahn (*Griechische und albanesische Märchen*, Leipsic, 1864), that the popular tales of European races turn on the same incidents, and display the same succession of situations, the same characters, and the same plots, as are familiar in the ancient epic literature of Greece, India, Germany, and Scandinavia. The epics are either fully-developed märchen evolved by the literary genius of poets and saga-men, or the märchen are degenerate and broken-down memories of the epics and sagas, or perhaps there may be examples of both processes.

The theory of the origin of popular tales in the fancy of peoples in the savage condition of their survival as märchen among the peasantry of Indo-European and other civilized races, and of their transfiguration into epics, could only be worked out after the discovery that savage and civilized popular tales are full of close resemblances. These resemblances, when only known to exist among Indo-European peoples, were explained as part of a common Aryan inheritance, and as the result of a malady of language. According to another view, märchen everywhere resemble each other because they all arose in India, and have thence been borrowed and transmitted.

On a general view, then, the stuff of popular tales is a certain number of incidents and a certain set of combinations of these incidents. Their strange and irrational character is due to their remote origin in the fancy of men in the savage condition; and their wide distribution is caused, partly perhaps by oral transmission from people to people, but more by the tendency of the early imagination to run everywhere in the same grooves. The narratives, in the ages of heroic poetry, are elevated into epic song, and in the Middle Ages they were even embodied in legends of the saints. This view is maintained at greater length, and with numerous illustrations, in the introduction to Mrs. Hunt's translation of Grimm's *Kinder- und Haus-Märchen* and in *Custom and Myth*, already referred to.

TALFOURD, SIR THOMAS NOON, was at once eminent as a lawyer, as a writer, and as a member of a brilliant and polished society. Though even his most excellent work in literature has now ceased to be generally cared for, his poetry must always be interesting to the literary student.

The son of a brewer in good circumstances, Talfourd was born on January 26, 1795, at Doxey, near Stafford, England (some accounts mention Reading). During his early years Talfourd found himself forced to depend—in great measure, at least—upon his literary exertions. He was at this period on the staff of the *London Magazine*, and was an occasional contributor to the *Edinburgh* and *Quarterly* reviews, the *New Monthly Magazine*, and other periodicals; while, on joining the western circuit, he acted as law reporter to *The Times*. His legal writings on matters germane to literature are excellent expositions, animated by a lucid and sufficiently telling, if not highly polished, style.

But Talfourd cannot be said to have gained any position among men of letters until the production of his tragedy *Ion*, which was privately printed in 1835, and produced in the following year at Covent Garden theater. The tragedy was also well received in America, and it met with the honor of reproduction at Sadler's Wells in December, 1861.

Two years later, at the Haymarket theater, *The Athenian Captive* was acted with moderate success. In 1839 *Glencoe, or the Fate of the Macdonalds*, was privately printed, and in 1840 it was produced at the Haymarket; but this home drama is indubitably much inferior to his two classic plays. Besides the honor of knighthood and his various legal distinctions, Talfourd held the honorary degree of D. C. L. from the University of Oxford. He died in court during the performance of his judicial duties, at Stafford, on March 13, 1854.

TALISMAN. See AMULET.

TALLAGE, or TALLIAGE (from the French *tailler*, *i. e.*, a part cut out of the whole), appears to have signified at first a tax in general, but became afterward confined in England to a special form of tax, the assessment upon cities, boroughs, and royal demesnes—in effect, a land tax. Like SCUTAGE *(q. v.)*, tallage was superseded by the subsidy system in the fourteenth century.

TALLAHASSEE, the capital of Florida and of Leon county, is situated twenty-six miles north of the Gulf of Mexico and 165 miles west of Jacksonville, on the Jacksonville, Pensacola & Mobile railroad. Its population has increased from 2,500 in 1880 to about 5,000. It contains the State House and other official buildings and has some small manufactories.

TALLEYRAND DE PERIGORD, CHARLES MAURICE, created by Napoleon a prince of the empire under the title of the Prince de Bénévent, was born at Paris on February 2, 1754. An accident in infancy rendered Talleyrand lame for life, and changed his whole career. His upbringing was, in accordance with the fashionable heartlessness of the day, entirely left to strangers; and while a boy he was, in consequence of his lameness, formally deprived by a *conseil de famille* of his rights of primogeniture—his younger brother, the Comte d'Archambaud, taking his place; and he was destined for the church. He keenly felt the blow, but was powerless to avert it; and he used his enforced profession only as a stepping stone to his ambition, always despising it, and coolly and defiantly forsaking it when he found it an embarrassment.

When he was removed from the country he was sent to the Collége d'Harcourt, where he speedily distinguished himself; and in 1770, when sixteen years of age, he became an inmate of the Séminaire de St. Sulpice, his education being completed by a course in the Sorbonne. Much as Talleyrand despised the church as a career, he never ceased highly to appreciate theology as a training, and he publicly testified to its value to the statesman and specially to the diplomatist. As early as 1780 we find this *abbé malgré lui* to have reached the important position of "agent general" of the French clergy. The clergy of his own diocese (Autun) elected him a member of the states-general; and he delivered before his constituents one of the most remarkable speeches which the crisis produced, containing a sagacious and statesmanlike programme of the reforms which the condition of France demanded. He thus entered the assembly as one of its leaders.

The states-general had hardly met ere Talleyrand's influence was called into play. On October 16, 1789, he was elected president of the assembly for the usual brief term. On various subjects he was now looked up to as an authority—on education, on electoral and ecclesiastical reform, on banking, and on general finance. His career as a diplomatist had not yet begun.

On July 14, 1790, Talleyrand, at the head of 300 clergy, assisted at the fête in the Champ de Mars in commemoration of the fall of the Bastille, and publicly blessed the great standard of France. In the end of April, 1791, he was suspended from his functions and excommunicated by the pope. Without a moment's hesitation Talleyrand abandoned his profession, which he never afterward resumed. Although, in 1801, the excommunication was recalled, it was nearly half a century after his first act of defiance ere he became personally reconciled to the church, and then only when he was at the point of death.

On purely political lines, however, Talleyrand's career became more and more celebrated. In the beginning of the month of April, 1791, he was appointed a director of the department of Paris. On the flight of the king in June, Talleyrand leaned at first, and cautiously, toward the duke of Orleans, but finally declared for a constitutional monarchy, with Louis XVI. still on the throne. Shortly after this event Talleyrand left France for England, reaching London in the end of January, 1792. With this visit his diplomatic career may be said to have begun.

He was not formally accredited, but had in his pocket an introduction to Lord Grenville by Delessart the foreign minister; the king himself was aware of his mission, the ostensible object of which was to conciliate England. He was nominally only attendant with De Chauvelin, the minister plenipotentiary, but he was really the head of the embassy, and he carried with him a letter of Louis XVI. to George III. At this time, indeed, Talleyrand's relations with Louis were very close—far closer than he afterwards cared or dared to avow. All, however, was of no avail. The startling course of the Revolution made the English look askance upon his mission, and he returned baffled to Paris, where he arrived shortly before the *coup d'état* of August 10th. But this place, where his wariest maneuvers were outdone by the rapidity of the popular movements, and where at any turn of affairs he might lose his head, was not to his liking; and by the middle of September he was for the third time in London, but he was, in the end of January, 1794, under the provisions of the Alien Act, ordered to leave England. Fortified with an introduction by Lord Lansdowne to Washington, he sailed for the United States.

A decree of the convention had issued against Talleyrand during his stay in England. He was an *émigré.* But as the excesses of the period drew to a close the proscription was recalled. On July 25, 1795, he arrived at Hamburg, whence he passed to Berlin, and, after a short stay there, to Paris. He was received with enthusiasm in the circles of fashion and intrigue. He would have been eagerly welcomed by any of the political parties as a strength; but the Directory was in power and he supported it. Within the Directory he supported Barras, as against his compeers. He was thus a moderate constitutionalist and in the way of advancement.

During his absence from France he had been elected a member of the Institute. He was now elected its secretary. Toward the end of the month of July, 1797, he was appointed to the post of foreign minister.

But his first term of office was short. His accessibility through bribery becoming known he was forced to resign. Public opinion was outraged. His official corruption, however, was not ended, for Talleyrand turned everything into gold; in his later diplomacy also he could always be bought; and this public immorality was but too faithfully reflected in his private life, in which gambling was his passion and a source of his vast wealth.

Out of office, but still pulling the strings of the Directory, he awaited the arrival of Napoleon in Paris, and it was his hand which was most powerful in shaping the events of the 18th and 19th Brumaire—November 9th and 10th, 1799. He reconciled Sieyès to Bonaparte; a majority of the Directory—Sieyès, Ducos, and at last at his persuasion even Barras—resigned; the Directory collapsed, and the consulate was established (see NAPOLEON and SIEYÈS). Napoleon was the first and Talleyrand the second man in France.

He was now an absolutist, the whole drift of his influence being in the direction of consolidating, under whatever title, the power of Bonaparte. For many years thenceforward Talleyrand's career was part of the general history of France. He was soon again foreign minister; and he is acknowledged to have been the ablest diplomatist of an age when diplomacy was a greater power than it has ever been before or since.

By and by, however, a change came over his political attitude, and it was not long ere Napoleon detected it. This change we date, with Sainte-Beuve, from the end of January, 1809. Before the peace of Tilsit, July 8, 1807, from Jena onwards, he had personally accompanied the great conqueror; after it they stood apart, for the statesman saw in those brilliant but ceaseless conquests the prelude to the ruin of his master and his country. So at the date stated the explosion occurred, Napoleon pouring upon Talleyrand all the fury of his invective, reproaching him with the affair of the Duc d'Enghien, and clamoring to know where his enormous wealth had come from—how much he had gained at play or on the stock exchange, and what was the sum of his bribes by foreign powers. Over and over again such scenes were repeated, the burden of the fierce reproaches being always the same; but Talleyrand stood impassive as a statue.

It is undoubtedly to his credit, however, that he steadily resisted a warlike policy, and that he was particularly opposed to the Russian invasion. He was occasionally employed in diplomatic negotiations, and was even again offered the post of foreign minister if he would give up that of vice-grand-elector. This offer, which would have placed him at the mercy of Napoleon, he declined, and the breach between the two widened. Before the events of 1814 his hotel had become the center of anti-Napoleonic intrigue; as the crisis approached he communicated with the allies. The revolution was his work; and his nominee, Louis XVIII., ascended the throne. For a third time, and again under a new master, he was appointed foreign minister. It would be difficult to overestimate the splendid services which he now rendered to France. He succeeded single-handed in breaking up the confederation of the allies, and in reintroducing the voice of France into the deliberations of the European powers. Further, on January 3, 1815, a secret treaty was concluded between Austria, France, and England.

When Napoleon escaped from Elba and advanced towards Paris, Louis XVIII. retired to Ghent. Although the congress of Vienna was thus broken up, Talleyrand made no haste to follow him thither. He was puzzled, and remained so during the Hundred Days. He despised Louis, and an early approach to Bonaparte was out of the question. He therefore coolly betook himself to Carlsbad, remarking, when an explanation was asked for, that the first duty of a diplomatist after a congress was to attend to his liver! Waterloo of course decided him. He appeared at Ghent, and was but coldly received. The foreign powers, however, intervened, conscious after Vienna of Talleyrand's value; and, among others, Wellington insisted that the great diplomatist must be taken into the councils of Louis,—with the result that he became prime minister at the second restoration. But his position was one of extreme difficulty. Fortunately an excuse of a broad and national kind soon presented itself. He objected to the conditions which the allies were imposing upon France, refused to sign the treaty, and on September 24th resigned office.

He retired into private life, in which he remained for fifteen years. But in 1830, when Charles X.'s reign was evidently imperiled, he again was at the center of intrigue; and it was actually at his private but urgent suggestion that Louis Philippe headed the revolution, taking, to begin with, the title of lieutenant-general of the kingdom. Declining the post of foreign minister, he proceeded to London as ambassador, conducting himself and serving his country with his usual consummate skill. He returned crowned with success after the formation of the Quadruple Alliance. In November, 1834, he resigned, and quitted public life forever.

He emerged from his retirement on March 3, 1838, to pronounce before the Institute the éloge of Reinhard, and in so doing to treat of diplomacy in general, and to suggest an indirect but adroit apology for his own career. He was received with unbounded enthusiasm by the élite of French literature and society—Cousin even exclaiming that the éloge was worthy of Voltaire. His last illness, which had by this time shown itself, soon prostrated him. He was visited on his death-bed by crowds of celebrities, including the king. He died on May 17, 1838, at the great age of eighty-four. He is buried at Valençay.

TALLIEN, JEAN LAMBERT, the chief leader of the party that overthrew Robespierre, was born in Paris in 1769. Being much excited by the first events of the Revolution, he entered a printer's office, and by 1791 he was overseer of the printing department of the *Moniteur*. While thus employed he conceived the idea of the *journal-affiche*, and from January to May, 1791, he placarded a large printed sheet on all the walls of Paris twice a week under the title of the *Ami des Citoyens*. On July 8, 1792, he was the spokesman of a deputation of the section of the Place Royale which demanded from the legislative assembly the reinstatement of Pétion and Manuel. and he was one of the most active popular leaders in the attack upon the Tuileries on August 10th, on which day he was appointed secretary or clerk to the revolutionary commune of Paris. At the close of the month he resigned his post on being elected, in spite of his youth, a deputy to the Convention by the department of Seine-et-Oise. He took his seat upon the Mountain, and showed himself one of the most vigorous Jacobins, particularly in his defense of Marat; he voted for the execution of the king, and was elected a member of the Committee of General Security on January 21, 1793. After a short mission in the western provinces he returned to Paris, and took an active part in the *coups d'état* of May 31st and June 2d, which resulted in the overthrow of the Girondins. For the next few months he remained comparatively quiet, but on September 23, 1793, he was sent with Ysabeau on his famous mission to Bordeaux. Tallien showed himself one of the most vigorous of the proconsuls sent over France to establish the Terror in the provinces; though with but few adherents, he soon awed the great city into quiet, and kept the guillotine constantly employed.

But the Terror could not be maintained at the same pitch; Robespierre began to see that he must strike at many of his own colleagues in the committees if he was to carry out his theories. and Tallien was one of the men condemned with them. They determined to strike first, and on the great day of Thermidor it was Tallien who opened the attack upon Robespierre. The movement was successful; Robespierre and his friends were guillotined; and the young Tallien, as the leading Thermidorian, was elected to the Committee of Public Safety. Now came the great months of his career; he showed himself a vigorous Thermidorian; he was instrumental in suppressing the Revolutionary Tribunal and the Jacobin Club; he attacked Carrier and Lebon, the proconsuls of Nantes and Arras; and he fought bravely against the insurgents of Prairial. His last political achievement was in July, 1795, when he was present with Hoche at the destruction of the army of the émigrés at Quiberon, and ordered the executions which followed. After the close of the Convention Tallien's political importance came to an end, for, though he sat in the Council of Five Hundred, the moderates attacked him as terrorist, and the extreme party as a renegade. Madame Tallien also got tired of him, and became the mistress of the rich banker Ouvrard. Bonaparte, however, who is said to have been introduced by him to Barras, took him to Egypt in his great expedition of June, 1798, and after the capture of Cairo he edited the official journal there, the *Décade Égyptienne*. But Menou sent him away from Egypt, and on his passage he was captured by an English cruiser and taken to London, where he had a good reception among the Whigs and was well received by Fox. On returning to France in 1802 he got a divorce from his unfaithful spouse (who eventually married the Prince de Chimay), and was left for some time without employment. At last, through Fouché and Talleyrand, he got the appointment of consul at Alicante, and remained there until he lost the sight of one eye from yellow fever. On returning to Paris he lived on his half-pay until 1815, when he received the especial favor of not being exiled like the other regicides. His latter days were spent in the direst poverty; he had to sell his books to get bread. He died at Paris on November 16, 1820.

TALLIS (TALLYS, TALYS, or TALLISIUS), THOMAS, justly styled "the father of English cathedral music," was born, as nearly as can be ascertained, about the year 1515.

One of the earliest compositions by Tallis to which an approximate date can be assigned is the well-known *Service in the Dorian Mode*, consisting of the *Venite*, *Te Deum*, *Benedictus*, *Kyrie*, *Nicene Creed*, *Sanctus*, *Gloria in Excelsis*, *Magnificat*, and *Nunc Dimittis*, for four voices, together with the *Preces*, *Responses*, *Paternoster*, and *Litany*, for five.

In 1575 Tallis and his pupil William Byrd obtained from Queen Elizabeth royal letters patent granting them the exclusive right of printing music and ruling music-paper for twenty-one years; and in virtue of this privilege they issued, in the same year, a joint work, entitled *Cantiones quæ ab argumento Sacræ vocantur, quinque et sex partium*, containing sixteen motets by Tallis and eighteen by Byrd, all of the highest degree of excellence. Some of these motets, adapted to English words, are now sung as anthems in the Anglican cathedral service. But no such translations appear to have been made during Tallis' lifetime; and there is strong reason for believing that, though both he and Byrd outwardly conformed to the new religion, and composed music expressly for its use, they remained Catholics at heart to the end of their days.

Tallis' contributions to the *Cantiones Sacræ* were the last of his compositions published during his lifetime. He did not, indeed, live to witness the expiration of the patent, though Byrd survived it and published two more books of *Cantiones* on his own account in 1589 and 1591, besides numerous other works. Tallis died November 23, 1585, and was buried in the parish church at Greenwich.

TALLOW is the solid oil or fat of ruminant animals, but commercially it is almost exclusively obtained from oxen and sheep. The fat is distributed throughout the entire animal structure; but it accumulates in large quantities as "suet" in the body cavity, and it is from such suet that tallow is principally melted or rendered. In commerce ox tallow and sheep tallow are generally distinguished from each other; although much nondescript animal fat is also found in the market. Ox tallow occurs at ordinary temperatures as a solid hard fat having a yellowish white color; when fresh and new it has scarcely any taste or smell; but it soon acquires a distinct odor and readily becomes rancid. The fat is insoluble in cold alcohol, but it dissolves in boiling spirit of 0.822 sp. gr. in chloroform, ether, and the essential oils. The hardness of tallow and its melting-point are to some extent affected by the food, age, state of health, etc., of the animal yielding it, the firmest ox tallow being obtained in certain provinces of Russia, where for a great part of the year the oxen are fed on hay. New tallow melts at from 42.5° to 43° C., old tallow at 43.5°, and the melted fat remains liquid till its temperature falls to 33° or 34° C. Tallow consists of a mixture of two-thirds of the solid fats palmitin and stearin, with one-third of the liquid fat olein. A fluid oil known as tallow oil is obtained from solid tallow by the separation by pressure of the greater part of the olein. Tallow oil is a useful lubricant and a valuable material for fine soap making, but it is not now abundantly prepared. Mutton tallow differs in several respects from that obtained from oxen. It is whiter in color and harder, and contains only about 30 per cent. of olein. Newly rendered it has little taste or smell, but on exposure it quickly acquires characteristic qualities and becomes rancid. Sweet mutton tallow melts at 46° and solidifies at 36° C.; when old it does not melt under 49°, and becomes solid on reaching 44° or 45° C. It is sparingly soluble in cold ether and in boiling spirit of 0.822 sp. gr.

TALLOWS, VEGETABLE. See OILS.

TALMA, JOSEPH FRANÇOIS, French tragedian, was born at Paris, January 15, 1763. On November 21, 1787, he made his début at the Comédie Française in *Mahomet*. He made his last appearance June 11, 1826, and died at Paris October 19th of that year.

TALMUD signifies—(1) "study of and instruction in anything (whether by any one else or by oneself)"; (2) "learning acquired"; (3) "style, system": as such it is synonymous with *Mishnah* in its fifth signification; (4) "theory," in contradistinction to "practice"—synonymous with *Midrash* in its fourth signification; (5) such interpretation of the Mosaic law as is apparent on the surface thereof and does not necessitate any further disquisition; (6) *Boroitho*, or the non-canonical *Mishnah;* (7) *Gemara*, *i.e.*, the oldest commentary on the canonical *Mishnah;* (8) the texts of *Mishnah* and *Gemara* combined—the meaning which is the one most commonly attached to the term *Talmud*. Although the word *Talmud* is not to be found in the Bible, there can be little doubt that it is a classical Hebrew term, as may be seen by the analogy of *Tahănūn*, "supplication," *Tanhūm*, "consolation," etc.

Recensions of the Talmud.—The Talmud exists in two recensions—the Palestinian, commonly, but by mistake, called *Talmud Yerushalmi*, and the Babylonian, correctly called *Talmud Babli*. The *Talmud Yerushalmi* embodies the discussions on the

Mishnah (*q.v.*) of hundreds of doctors, living in Palestine, chiefly in Galilee, from the end of the second till about the middle of the fifth century, while the Babylonian Talmud embodies chiefly the discussions on the same *Mishnah* of hundreds of doctors living in various places in Babylonia, such as Neharde'a, Kaphri, Mahuza, Shekhansib, but notably at the two great academies of Sura and Pumbaditha, from about 190 to nearly the end of the sixth century. The doctors of both recensions, although they primarily discuss the correctness of the text and meaning of the *Mishnah*, and what should be the right legal decision according to it, do not confine themselves to this. They introduce, as occasion serves, not merely the whole of the oral tradition handed down to their time, and the necessary references to, and interpretations of, the various laws to be found in the Pentateuch and the other sacred writings, but exhibit also, though only in a fragmentary manner, an almost complete cycle of the profane sciences as current orally and known to them by books composed by Jews and Gentiles.

System of the Talmud.—Most people imagine not only that the Talmuds are a pathless wilderness, without so much as grammatical rules in their respective languages, but that the laws laid down in them rest on mere tradition In reality their languages have strictly grammatical rules, and their laws rest on a strictly logical system. The laws in both Talmuds are discussed and argued on philosophical rules, for which it is claimed that they have existed from time immemorial and can be traced to the Pentateuch itself. In addition, most of the points to which these rules apply are secured by early tradition. It is quite true that by idiosyncrasy digressions are very frequent both in Talmud and *Midrash;* but in the *Halakhah* the digression, however long, invariably ends in coming back to the original cause of the logical combination, while in the *Agadah* the digression either comes back to the place from which it started, or else will be found, on examination, to have been introduced for its own sake, and have served its own purpose. As the doctors of Talmud and *Midrash* are mostly introduced in dialogues, this is the only practical, if somewhat uncommon, method.

Division of the Talmud.—The external division of both Talmuds is identical with the division, subdivision, and sub-subdivision of the *Mishnah*, although there is not always *Gemara* in the one when there is *Gemara* in the other. Concerning the internal division into *Halakhah* and *Agadah*, it ought to be said that the former is more largely represented in the Babylonion Talmud, while the latter is more largely and more interestingly given in the Palestinian Talmud.

Purpose—The Talmud, unlike the *Mishnah*, contains not only individual decisions, but everything that is necessary for arriving at legal and religious decisions of whatever description these may be, while, like the *Mishnah*, it is not itself a handbook of decisions. This is only in accordance with the nature and spirit of an oral law which delegates the decisions to the Talmudico-speculative capacities of the teachers of every age.

Editors.—The editorship of the Palestinian Talmud is generally, after Maimonides, ascribed to Rabbi Yohanan (b. Napha). But this, if literally taken, is a gross mistake, as that teacher (*ob.* 279) died more than a hundred years before the latest *Amora* (*c*450) mentioned in that Talmud. A similar error is made with respect to the editor or editors of the Babylonian Talmud, whose names are given as Rab Asshi (see Rab) (*ob.* 427) and Rabina (*ob.* 550), and who lived still much earlier than the last teachers mentioned in that Talmud (eighth century). But it ought to be remembered that when the ancients speak of editors of books of such a mixed character as the *Mishnah*, the *Zohar*, both Talmuds, etc., they mean the person or persons who gave the first impulse to the collection or redaction of such books. In this sense, certainly, Rabbi Yohanan was the editor of the Palestinian and Rab Asshi and Rabina were the editors of the Babylonian Talmuds.

Value.—The value of the Talmuds may be estimated by the fact that they contain the *Mishnah* in various recensions and a large portion of the contents of Midrashic collections, and in addition comprise a vast amount of Sopheric literature not to be found in the canonical *Mishnah* and Agadic matter not to be found in the known *Midrashim*, and have thousands of notices on secular knowledge of all kinds.

Vicissitudes of the Talmud.—While the Babylonian Talmud commanded the attention of a hostile world, and was proscribed, mutilated, and condemned, and finally delivered over to the flames by popes and kings, the Palestinian Talmud suffered still more from one single enemy—neglect. Thousands of copies of the former recension were destroyed in the course of time, but, this Talmud being studied in all parts of the world, the few copies surviving became the means of an endless supply. Not so as regards the Palestinian Talmud, which found no students, or but few, after the closing (*c* 450) of the Jewish academies in Palestine; and we have even to thank the enemies of traditional Judiasm, the Karaites, who used it in controversy with their Rabbanite opponents, for the preservation of some copies of it. By degrees the neglect of the book became so great that whole chapters of treatises, whole treatises of orders, and almost two whole orders themselves, disappeared, and are lost to this day.

TAM, commonly called Rabbenu Tam, more correctly Rabbenu Tham (רַבֵּנוּ תָּם=ר״ת). By this title are known two eminent Rabbinic scholars, both named Ya'akob, to whom this epithet was given in allusion to Genesis xxv. 27: "And Jacob was a *perfect* man" (*Ish Tam*, אִישׁ תָּם). They belong to the north of France, lived in the twelfth century, and were master and pupil.

1. Rabbenu Ya'akob b. Meir b. Shemuel was, on his mother's side, a grandson of Rashi, (*q.v.*) He was his parents' third son, the greatest Talmudist after his maternal grandfather's death, but he also added reading wide and varied to a stupendous memory and a marvelous power of combination, such as appeared only again in the last century in the persons of R. Yehonathan Eybenschütz (*ob.* 1764) and R. Yehezkel Landau (*ob.* 1793). Let us add that he was a lexicographer, grammarian, and Biblical commentator of no mean order; that he was a poet in Hebrew and Aramaic inferior only to Ibn Gebirol, (Avicebron, *q.v.*) Mosheh Ibn 'Ezra, and Yehudah Hallevi (and by far greater in this art than the commentator Abraham Ibn 'Ezra); that he was held in high esteem by prince and nobles; and that he was a man of great wealth, with which he generously supported, not merely his own poorer hearers, but other itinerant scholars also.

2. Rabbenu Ya'akob of Orleans, rabbi of London (?). He is often quoted in the *Tosaphoth* (both on the Pentateuch and on the Babylonian Talmud). No independent works of his, however, are extant. He was killed at London in the tumult on the coronation day of Richard Cœur-de-Lion (September 3, 1189).

TAMMANY SOCIETY, one of the largest and most powerful political organizations in the United States, is identified with the Democratic party, and was chartered by the New York legislature in 1805. Its history dates back to the earliest settlements in America. According to one account, its name was an adaptation of the name of an Indian chief (Tamanend) of great power in Pennsylvania, who was selected by the troops from that State engaged in the Revolutionary War as their patron saint shortly prior to the close of hostilities. Another story related in connection with the formation of the society is that its origin is due to William Mooney, an impulsive Irishman of New York city, who organized the "Columbian Society" about the date of the first inauguration of Washington, as a rebuke to the aristocratic affiliations and inclinations of the "Society of Cincinnati." Still a third authority declares that the organization of Tammany was had as an expression of the popular opinion against the removal of disabilities of prominent Tories who had resided in New York city during the Revolutionary War. Whatever may have prompted the formation of the society, it has steadily grown in membership and importance and continues to wield a potent influence in local, State, and national politics. The earlier administration of its affairs was according to Indian forms and precedents, relics of aboriginal usage, that in a modified way are still preserved. Mooney, the pioneer "Grand Sachem," was supreme commander, having under his direction subordinate sachems or chiefs and other officers, together with members. Its by-laws and rules of political conduct were in harmony with the principles of Republicanism of the most radical type, and excluded Federalists from participation as members or otherwise. Its power began to be felt at an early day—some declare that such power and the society influence was so successfully manipulated by Aaron Burr that in his hands it became "as clay in the hands of the potter"—in the direction of New York politics, and this, notwithstanding Burr was never a member. However that may be, with its aid he defeated the Federal party in the city and State of New York, thereby earning a prestige which obtained for him the vice-presidential nomination. The methods he had employed in that struggle alienated from him the society support, and eventually led to the duel at Weehawken, which terminated his political career.

Among the earlier labors of the society was its effort directed to securing an amendment to the State constitution giving the right of suffrage to voters irrespective of property qualifications. This, however, was not accomplished until 1821. Up to 1828, the society was not specially identified with the Democratic party. But since that year it has been a conspicuous advocate of the principles of that political organization. After sustaining defeat at the hands of both the Equal Rights and American parties, the latter in 1844, the society was divided into two parties, known as the "Hards" and "Softs." This action really grew out of the division of the Democratic party into "Hunkers" and "Barnburners," and lasted for many years. Both factions united, however, in 1854, and elected Fernando Wood mayor of New York city, but a permanent peace was not reached, and in 1858, though Mr. Wood was the nominee of Tammany Hall, the struggle for ascendancy of the opposing factions brought about his defeat. The next year he was elected spite of Tammany opposition.

During the war the society not only maintained its organization but was strengthened by the accession of a large number of members. On July 4, 1867, the corner stone of Tammany Hall on Fourteenth street, near Irving place, was laid with impressive ceremonies, and one year later the National Democratic convention met in the building and nominated Horatio Seymour, of New York, and Francis P. Blair, of Missouri, for president and vice-president respectively. About this period Tammany fell under the dictation of a ring composed of William M. Tweed, Peter B. Sweeney, Richard B. Connolly, A. Oakey Hall, and others, and peculation and fraud were openly practiced. All efforts to put a period to this condition of affairs fell by the wayside; while William M. Tweed, upon being charged with fathering and promoting these unlawful schemes, replied from his luxurious apartments in the Americus Club House: "What are you going to do about it?" a sententious defiance that will be remembered as a part of the history of the times. The frauds were first exposed in the New York *Times*, and led to the formation of a committee of prominent citizens composed of the venerable Charles O'Conor, Samuel J. Tilden, Manton Marble, John Kelley, and other leading Democrats, whose efforts in securing the indictment of Tweed and his abettors were successful, resulting in the permanent and effectual destruction of the ring. Tweed and his satellites sought safety in flight, and while the leader was recaptured and punished, many of the conspirators remained abroad and thus escaped his fate.

Early in the seventies John Kelley become Grand Sachem. He was a man of decided views, possessed of endless political resources and great acumen, and though declining political preferment, exerted an influence among the Tammany braves that upon more than one occasion turned the tide of defeat into the channel of victory. When Lucius Robinson was nominated for governor of the State in 1879, Tammany bolted the convention and placed John Kelley in nomination as Robinson's opponent, thereby defeating the latter. Again, in 1880, Tammany secured the defeat of Hancock, the Democratic candidate for president of the United States. In 1884 the defeat of Cleveland's nomination at Chicago was attempted Efforts in that direction began at the Saratoga convention, when the unit rule was adopted in spite of Tammany. When the voting for candidates in the Chicago convention commenced, Tammany, led by Bourke Cochrane, Senator Grady and others, protested against the action taken at Saratoga, but failed of their object. In the last national campaign the defeat of the Democratic candidate was charged in part to Tammany opposition, though H. J. Grant, Tammany's candidate for mayor of New York city, was elected. Since that year members of the organization officially connected with the local government of the city have been accused of peculation and fraud, while the sheriff of New York county, also a member of Tammany, was indicted for perjury, and resigned his office. The present Grand Sachem is Richard Croker, who returned from Europe in June, 1890, to testify before a committee appointed by the State Senate to investigate the frauds above referred to, and others in connection with some of the city departments.

TAMAQUA, a prosperous village nestling among the hills of Schuylkill county, Penn., is situated on the Tamaqua or Schuylkill river in the center of some of the richest anthracite coal territory of the State. The New Jersey Central division of the Philadelphia and Reading road places Tamaqua within easy distance of Philadelphia, ninety-eight miles to the southeast, also connecting the village with Reading and Pottsville, forty miles south and seventeen miles southwest respectively. It contains two banks and one weekly paper, twelve churches, a high school, public library and number of stores and hotels, besides two foundries, two boot and shoe factories, two flour-mills, two carriage manufactories; truss, cigar, and screen factories; and one powder mill. The present (1890) population is 4,672. Extensive mining operations are conducted in the vicinity.

TAMARIND. This name is popularly applied to the pods of a Leguminous tree, which are hard externally, but within filled with an acid juicy pulp containing sugar and various acids, such as citric and tartaric, in combination with potash. The acid pulp is used as a laxative and a refrigerant, the pods being largely imported both from the East and the West Indies. The tree is now widely distributed in tropical countries, but it is generally considered that its native country is in eastern tropical Africa, from Abyssinia southward to the Zambesi. The tree (*Tamarindus indica*, L.) attains a height of seventy to eighty feet, and bears elegant pinnate foliage and purplish or orange veined flowers arranged in terminal clusters.

TAMARISK. The genus *Tamarix* gives its name to a small group of shrubs or low trees constituting the tamarisk family. The species of tamarisk and of the very closely allied genus *Myricaria* grow in salt deserts, by the sea-shore, or in other more or less sterile localities in south temperate, subtropical, and tropical regions of the eastern hemisphere. Their long slender branches bear very numerous small appressed leaves, in which the evaporating surface is reduced to a minimum. The great value of these shrubs or trees lies in their ability to withstand the effects of drought and a saline soil, in consequence of which they grow where little else can flourish. It is on this account that the common tamarisk, *T. gallica*, is planted on the sea-coasts, and affords shelter where none other could be provided.

TAMBOFF, one of the largest and most fertile governments of central Russia, extends from north to south between the basins of the Oka and the Don, and has Vladimir and Nijni-Novgorod on the north, Penza and Saratoff on the east, the Don Cossacks and Voronezh on the south, Tula and Ryazañ on the west.

The climate is continental, and, although the average temperature at Tamboff is 42° F., the winter is comparatively cold (January, 13°; July, 68°). The rivers remain frozen for four months and a half. Forests occupy less than one-sixth of the total area, and occur chiefly in the west; in the southeast wood is scarce, and straw is resorted to for fuel. The soil is fertile throughout: in the north, indeed, it is clayey and sometimes sandy, but the rest of the government is covered with a sheet two to three feet in thickness, of the most fertile *tchernozem*, of such richness, indeed, that in Borisoglyebsk cornfields which have not been manured for eighty years still yield good crops.

Tamboff is one of the densely peopled provinces of Russia. Its population in 1883 reached 2,519,660, and in several districts (Kozloff, Lebedyañ, Lipetsk) there are from 110 to 130 inhabitants per square mile.

TAMBOFF, capital of the above government, 300 miles distant from Moscow, is situated on the Tsna river, and on the railway from Kozloff to Saratoff. The population in 1884 was 34,000.

TAMERLANE. See TIMUR.

TAMILS. The word *Tamil* has been identified with Dravida, the Sanskrit generic appellation for the South Indian peoples and their languages.

The Tamils, taken as the type and representatives of the Dravidian race, do not now, owing to early intermixture with the Aryan immigrants, materially differ in physical character from the other curly-haired indigenous population of India. They were at one time, on the ground of the general structure of their language, classed with the Mongoloid (Turanian, Scythian) and even the Australian races, but that classification is rejected by all the leading ethnologists. They form, in fact, with the other members of the group, a separate and distinct family, which is of the dolichocephalic class, and comes near the Indo-European or Aryan type; while there are scattered remnants of a still earlier population of India (Mundas, Kolarians), whose race characteristics, however, do not so essentially differ from those of the Dravidians as to constitute them a class by themselves. The Tamils proper are smaller and weaker-built than the Europeans, though more graceful in shape.

Language.—The area over which Tamil is spoken extends from a few miles north of the city of Madras to the extreme south of the eastern side of the peninsula, throughout the country below the Ghâts, from Pulicat to Cape Comorin, and from the Ghâts to the Bay of Bengal, including also the southern portion of Travancore on the western side of the Ghâts and the northern part of Ceylon. According to the census of 1881, the number of Tamil-speaking people throughout the province was 12,413,517, inclusive of 21,992 Yerkalas, 3,843 Kurumbas, and 287 Irulas, three tribes speaking rude dialects of the language. To these should be added about 160,000 in the French possessions.

TAMWORTH, a municipal borough and market-town of England, on the borders of Staffordshire and Warwickshire, chiefly in the former, is situated at the junction of the Tame with the Anker, and on branches of the London and North-Western and Midland railway lines, 7 miles southeast of Lichfield, 20 northwest of Coventry, and 110 northwest of London. The population of the muncipal borough (area 200 acres) in 1871 was 4,589, and in 1881 it was 4,891—that of the parliamentary borough (area 11,602 acres) in the same years being 11,493 and 14,101. Tamworth ceased to be a parliamentary borough in 1885.

TANAGER, a word adapted from the quasi-Latin *Tanagra* of Linnæus, which again is an adaptation, perhaps with a classical allusion, of *Tanagra*, used by Brisson and Buffon, and said by Marcgrave to be the Brazilian name of certain birds found in that country. From them it has since been extended to a great many others mostly belonging to the southern portion of the New World, now recognized by ornithologists as forming a distinct Family of *Oscines*, and usually considered to be allied to the *Fringillidæ* but, as may be inferred from Professor Parker's remarks in the Zoölogical *Transactions*, the *Tanagridæ* are a "feebler" form, and thereby bear out the opinion based on the examination of many types both of Birds and Mammals as to the lower morphological rank of the Neotropical Fauna as a whole.

On a whole the *Tanagridæ* may perhaps be considered to hold the same relation to the *Fringillidæ* as the *Icteridæ* do to the *Sturnidæ* and the *Mniotiltidæ* to the *Sylviidæ* or *Turdidæ*, in each case the purely New-World Family being the "feebler" type.

TANCRED (d. 1112), son of the marquis Odo the Good and Emma the sister of Robert Guiscard, one of the most famous heroes of the first crusade. See CRUSADES.

TANCRED, the last Norman king of Sicily, reigned 1189–1194. See SICILY.

TANGANYIKA, a lake in East Central Africa, called *Msaga* ("tempestuous") by the Wakawendi and *Kimana* by the Warungu. The meaning of the name Tanganyika is, according to Cameron, nothing more than "the mixing place." It is the longest freshwater lake in the world, being about seventy-five miles longer than Lake Michigan.

Tanganyika is fed by numerous rivers and streamlets which flow from the surrounding hills, the yearly rainfall being about twenty-seven inches, but the rainy seasons vary extremely in different years, altering the surface area of the lake accordingly. Hore found that between March, 1879, and August, 1880, the waters had fallen ten feet four and one-half inches, as marked by a water-gauge he had erected at Ujiji, and he also saw evident signs of the receding of the waters all round the shores of the lake—belts of dead timber and bleached rock. Some 120 rivers and streams flow into the lake; the most important river is the Malagarasi, near Ujiji. Just below the rapids its width is 500 feet, and the average depth five feet. For many years Tanganyika was a riddle to African explorers—Livingstone, Baker, and others believing that it belonged to the Nile system, and that it was connected with the Albert Nyanza. That this theory is incorrect was proved when Livingstone and Stanley explored the north end of the lake in November, 1871, finding no outlet. It was Cameron in March, 1874, who first solved the riddle, and found that the outlet of Tanganyika was the river Lukuga, at about the center of the western shore of the lake, 5° 52′ 45″ S. latitude. In 1876 this outlet was visited by Stanley, who found that there was no apparent outflow, and doubt was thrown upon Cameron's observations, which, however, have been proved to be correct by Hore, who in 1880 found a strong current setting unequivocally out of the lake. Not only so, but he obtained good views of the river, which gradually widens soon after the rapids near the lake are passed. He followed the river to 5° 50′ S. latitude, and, from an altitude of 1,100 feet above the river, he saw it flowing far away to the westward. The question is therefore settled that Lake Tanganyika belongs to the Congo system, but it is only an occasional tributary to that mighty river, its contribution depending upon the rainfall.

TANGIERS, or TANGIER (*Tanja*), a seaport of Morocco and capital of a pashalik, on the Strait of Gibraltar, about fourteen miles to the east of Cape Spartel, stands on two eminences at the northwest extremity of a spacious bay. Tangiers is the residence of all the foreign ministers and consuls to the court of Morocco, has a population estimated at about 20,000, of whom some 400 are Europeans.

TANGLE, the common name of *Laminaria digitata* and *L. saccharina*, two species of sea-weed, natives of the British shores, growing on rocks in deep water. The stem is woody, the frond leathery, flat and without a midrib. The young stems form an article of food, are nutritious, owing apparently to the large quantity of gelatinous matter which they secrete. They are also used for feeding cattle. *L. potatorum*, a large species, supplies the aborigines of Australia with instruments, vessels, and food. The woody stems are sometimes used for knife handles.

TANHÄUSER, or TANNHÄUSER, the subject of one of the most famous of old German legends, is represented as a knight who after many wanderings comes to the Venusberg. He enters the cave where the Lady Venus holds her court, and abandons himself to a life of sensual pleasure. By and by he is overcome by remorse, and, invoking the aid of the Virgin Mary, he obtains permission to return for a while to the outer world. He then goes as a pilgrim to Rome, and entreats Pope Urban to secure for him the forgiveness of his sins. The pope, who happens to have a rod in his hand, says it is as impossible for him to be pardoned as for the rod to blossom. Tanhäuser therefore departs in despair, and returns to the Lady Venus. In three days the rod begins to put forth green leaves, and the pope sends messengers in all directions in search of the penitent; but he is never seen again. This legend was at one time known in every part of Germany, and as late as 1830 it survived in a popular song at Entlibuch, a version of which was given by Uhland in his *Alte hoch- und niederdeutsche Volkslieder.* It can be traced back to the fourteenth century, but in its original form seems to have belonged to the period of Teutonic paganism.

TANJORE, a district of British India, in the Madras presidency, lying between 9° 50′ and 11° 25′ N. latitude and between 78° 55′ and 79° 55′ E. longitude, with an area of 3,654 square miles.

The census of 1881 returned the population of the district at 2,130,383 (males 1,026,528, females 1,103,855), of whom 1,939,421 were Hindus, 112,058 Mohammedans, and 78,258 Christians. Tanjore is the first district in which Protestant missions began, and now it is second only to Tinnevelly in the number of its Christian missions. These establishments were taken over in 1826 by the Society for the Propagation of the Gospel, which subsequently founded missions in several parts of the district. The total number of native Protestants belonging to the various societies in 1881 was 8,255. Roman Catholic missions in Tanjore date from the first half of the seventeenth century, and the number of native Roman Catholics in 1881 was 67,745.

TANJORE, capital and administrative headquarters of the above district, is situated in 10° 47′ N. latitude, and 79° 10′ 24″ E. longitude. It contained a population in 1881 of 54,745 (26,272 males and 28,473 females). The South Indian railway connects Tanjore with Negapatam, its seaport on the east, and Trichinopoly on the west.

TANNAHILL, ROBERT, was born on June 3, 1774, at Paisley, Scotland, where he was brought up a weaver. He exhibited, very early, a taste for poetry, and was ambitious to distinguish himself as a poet. His writings soon became known, and won him a local celebrity, which, on the publication in 1807, of a collection of his poems and songs, new and old, was ratified by a wider acceptance. He was found one morning, May 17, 1810, drowned, in a canal near Paisley, and there seems to be almost no reason to doubt that his death was that of a suicide. A morbid melancholy, which seems to have been gradually growing upon him, had no doubt dictated self-destruction.

TANNIN, a generic name for a class of vegetable substances which, as the name indicates, are all available for tanning, meaning the conversion of animal hide into leather. Tannin is widely diffused throughout the vegetable kingdom. An enumeration of the principal materials which form the commercial sources of the substance will be found under LEATHER, and in various special articles referred to from that heading.

Our chemical knowledge on the subject is very limited; and, as long as we know no better, each of the various tanning materials must be viewed as containing a "tannin" of its own kind. Only a few have as yet been obtained in a state approximating chemical purity.

All are colorless or little-colored non-volatile solids, soluble in water and in alcohol; the solution has an astringent taste.

They color blue litmus paper feebly red, yet all unite with the alkalies into soluble salts; the solutions of these eagerly absorb oxygen from the air, with formation of dark-colored products.

They form insoluble salts with the oxides of lead, zinc, copper, producible by addition of solution of the tannin to one of the respective acetate.

They form very dark colored (green or blue) compounds with ferric oxide, conveniently producible by addition of the tannin to ferric or ferroso-ferric acetate. Ordinary old-fashioned black (gall-nut) ink may be quoted as an illustration.

Tannin solutions precipitate gelatine as an insoluble compound, generally assumed to be chemically similar to the substance of leather.

If a piece of raw hide be placed in a solution of any tannin, it imbibes the latter with formation of leather.

Aqueous tannin-solutions, if mixed with dilute sulphuric acid, are readily oxidized by solution of permanganate of potash, which, being reduced to manganous salt, loses its intense violet color.

TANNING. See LEATHER.

TANTALUM. A rare element closely allied to NIOBIUM, (*q.v.*)

TANTALUS, a hero of ancient Greek myth and legend. He was a son of Zeus and Pluto (" Wealth "), and became the father of Pelops, Proteus, and Niobe. He dwelt in splendor on Mount Sipylus near Smyrna, and was admitted to the table of the gods themselves; but he abused the divine favor by revealing to mankind the secrets he had learned in heaven, or by killing his son Pelops and serving him up to the gods at table. Another story was that he stole nectar and ambrosia from heaven and gave them to men. According to others, Pandareus stole a golden dog which guarded the temple of Zeus in Crete, and gave it to Tantalus to take care of. But, when Pandareus demanded the dog back, Tantalus denied that he had received it. Therefore Zeus turned Pandareus into a stone, and flung down Tantalus with Mount Sipylus on the top of him. The punishment of Tantalus in the lower world was famous. He stood up to his neck in water, which fled from him when he tried to drink of it; and over his head hung fruits which the wind wafted away whenever he tried to grasp them. From this myth is derived the English word "tantalize."

TAOISM. See LÂO-TSZE.

TAORMINA (*Tauromenium*), now an unimportant village of about 3,000 inhabitants, is magnificently situated at the edge of a precipitous cliff 900 feet high on the east coast of Sicily, about thirty-two miles from Messina and the same from Catania.

TAPACULO, the name given in Chili to a bird of singular appearance—the *Pteroptochus albicollis* of ornithology—and applied in an extended sense to its allied forms, which are now found to constitute a small Family, *Pteroptochidæ*, belonging to the Tracheophonous division of *Passeres*, and therefore peculiar to South America. About twenty species, which are disposed of by Mr. Sclater in eight genera, are believed to belong to this group.

The true Tapaculo (*P. albicollis*) has a general resemblance in plumage to the females of some of the smaller Shrikes (*Lanius*), and to a cursory observer its skin might pass for that of one; but its shortened wings and powerful feet would on closer inspection at once reveal the difference. In life, however, its appearance must be wholly unlike, for it rarely flies, hops actively on the ground or among bushes, with its tail erect or turned toward its head, and continually utters various and strange notes—some, says Mr. Darwin, are "like the cooing of doves, others like the bubbling of water, and many defy all similes." The "Turco," *Hylactes megapodius*, is larger, with greatly developed feet and claws, but is very similar in color and habits. Two more species of *Hylactes* are known, and one other of *Pteroptochus*, all of which are peculiar to Chili or Patagonia. The species of *Scytalopus* are as small as Wrens, mostly of a dark color, and inhabit parts of Brazil and Colombia, one of them occurring as far northward as Bogota.

TAPESTRY. See TEXTILES.

TAPE-WORMS, or CESTODA, are a group of worms forming one of the three main divisions of the *Platyhelminthes*, the other two being the ***Turbellaria*** (see PLANARIANS and NEMERTINES) and *Trematoda* (see TREMATODA). They have been defined as follows: "Flat worms without mouth or alimentary canal, which typically develop by alternation of generations, by budding from a generally pear-shaped nurse, with which they remain united for a lengthened period as a ribbon-like colony or 'strobila.' The individual joints of the colony, *i.e.*, the sexual animals or 'proglottides,' increase in size and maturity as they are removed farther from their origin by the intercalation of new buds, but are not distinguished in any special way. The nurse, however, known by the name of the 'head' (*scolex*), is provided with four or two suckers, and usually with curved, claw-like hooks. The dorsal and ventral surfaces of the head are perfectly identical, so that the arrangement of the hooks presents a strikingly radiate appearance. By means of this apparatus the worms fasten themselves on the intestinal membrane of their hosts, which (except in the case of the otherwise peculiar *Archigetes*) all belong to the *Vertebrata*. The nurses develop from little round six-hooked embryos in a more or less complicated fashion as so-called 'bladder-worms.' The latter inhabit very diverse, but usually parenchymatous, organs of the higher and lower animals, and are thence passively transferred to the intestines of their subsequent host." (Leuckart, 1, p. 270.)

Pathological Effects.—The pathological effects of Cestodes fall naturally into two categories—(1) those due to the adult worm, and (2) those due to the larvæ or bladder worms.

(1) Those of the first group are in general slight, being confined to the abstraction of a certain amount of nutriment, and to a more or less acute feeling of irritation, sometimes amounting even to colic-like pains, in the intestine. There have indeed been many authorities who have maintained that they were beneficial; Jördens went so far as to describe them as the good angels and unfailing helpers of children, and Schimper records that the Abyssinians consider that they prevent constipation, and only regard them as disadvantageous when they grow too long. Notwithstanding all this, however, there are not a few cases on record in which anæmia and neurotic, or even mental, diseases have been caused by the malnutrition and irritation which they occasion.

(2) The effects of Cestode larvæ may again be divided into two subdivisions. (*a*) That due to the invasion and wandering of a large brood of six-hooked embryos has been most successfully studied in cases in which animals have been fed for experimental purposes with fragments of ripe tape-worms; in such instances a train of symptoms has been observed to which the name "acute cestodic tuberculosis" has been given. It is characterized by loss of appetite, fatigue, ruffling of the hair, and fever; on post-mortem examination it has been found that the lymphatic system is in a state of inflammation, while the muscles present the appearance which has already been described. (*b*) The effects of formed bladder-worms may be summed up as dependent upon the pressure of the growing cyst and the consequent absorption of the surrounding tissues of the host, so that the importance of the results depends almost entirely upon the organ which is affected. Bladder-worms in the brain are, of course, the most frequently fatal, especially when, as is not infrequently the case, they exert pressure upon the ganglia at its base. Küchenmeister has collected a considerable number of occurrences of cystic worms in the brain; among these sixteen were not accompanied by pathological symptoms during life; in six others these were slight; twenty-four were cases of epilepsy, six of cramp,

forty-two of paralysis, and twenty-three of mental disturbances of varying intensity. *Cysticerci* in the brain vary greatly in size and form according to the precise situation which they occupy; in its ventricles they have been found as large as a pigeon's egg. In the meshes of the arachnoid the bladder sometimes grows into a remarkably branched structure, which has been called *Cysticercus racemosus* by Zenker (3). Another peculiar form from the same organ has been described by Köberlé (4); it is characterized by the great length of its head-process (2 cm.), which is coiled up into a regular spiral of sometimes three turns; it has received the name *Cysticercus turbinatus*, though its specific distinctness is doubtful. The occurrence of *Cysticerci* in the eye is of special interest, because of the opportunity it affords of observing, by means of the ophthalmoscope, the development of the worm in its natural environment. It seems generally to lie at first below the retina, and is visible as a bluish-white, sharply defined body; subsequently the retina is destroyed by the pressure, and the worm falls forward into the vitreous body; sometimes the head may be seen protruding first through the opening; in the chambers of the eye the *Cysticercus* is almost always free, that is, without a capsule, and swimming in the fluid, so that its form and motions may be readily and accurately observed. A large number of cases of this affection have been recorded, principally by Von Graefe in Berlin (5), and in some the bladder has been successfully removed by operation.

The special symptoms of the *Echinococcus* vary, like those of other bladder-worms, with its situation and size: when it grows within cavities with more or less firm limits compression of adjoining vessels and glandular passages often results, producing œdema, varicose veins, congestion of various organs, or even dyspnœa, if the parasite occur in the thorax. The liver is its most frequent seat, and next the lung; but there is scarcely any organ of the body in which it has not been found, even the bones being sometimes affected. Since the expanding cyst grows in the direction of least resistance, it has a tendency to pass toward the surface of organs, and sometimes a cure is effected spontaneously by its rupturing into the alimentary canal or into some other passage leading to the exterior. Cases in which the cyst opens into the blood-vessels are almost always suddenly fatal. When the *Echinococcus* occurs near the surface of the body, it may be evacuated by puncture and a cure effected with but little risk.

The treatment for tape-worm is the administration first of a purgative and then of turpentine or male fern. Give the turpentine in half ounce doses in emulsion with an egg or with castor oil.

TAPIOCA is a farinaceous food substance prepared from cassava starch, the product of the large tuberous roots of the cassava or manioc plant, *Manihot utilissima* (*Jatropha manihot*), native of Brazil (see CASSAVA, ARROWROOT). Cassava starch, being separated from the fibrous and nitrogenous constituents of the roots, is in a moist condition spread upon iron plates, and with constant stirring exposed to such heat as causes a partial rupture of the starch granules, which agglomerate into irregular pellets, becoming hard and translucent when cooled. In this partly torrefied condition the starch forms the tapioca of commerce.

TAPIR. This once numerous group is at present represented by only three rather isolated families, the horses, rhinoceri, and tapirs. The last of these have retained much more of the original characteristics of the primitive ungulates of the Eocene period than the others, and have indeed remained practically almost unchanged since the Miocene period, while almost all other mammalian forms which existed then have either become extinct or undergone extensive modifications. The tapirs constitute the single genus, *Tapirus*, of the family *Tapiridæ*.

The existing species of tapir may be grouped into two sections, the distinctive characteristics of which are only recognizable in the skeleton. (A) With a great anterior prolongation of the ossification of the nasal septum (mesethmoid), extending in the adult far beyond the nasal bones, and supported and embraced at the base by ascending plates from the maxillæ (genus *Elasmognathus*, Gill). Two species, both from Central America, *Tapirus bairdi* and *T. dowi*. The former is found in Mexico, Honduras, Nicaragua, Costa Rica, and Panama; the latter in Guatemala, Nicaragua, and Costa Rica. (B) With ossification of the septum not extending farther forward than the nasal bones (*Tapirus* proper). Three species, *T. indicus*, the largest of the genus, from the Malay Peninsula (as far north as Tavoy and Mergui), Sumatra, and Borneo, distinguished by its peculiar coloration, the head, neck, fore and hind limbs being glossy black, and the intermediate part of the body white; *T. americanus* (*T. terrestris*, Linn.), the common tapir of the forests and lowlands of Brazil and Paraguay; and *T. roulini*, the Pinchaque tapir of the high regions of the Andes. All the American species are of a nearly uniform dark brown or blackish color when adult; but it is a curious circumstance that when young (and in this the Malay species conforms with the others) they are conspicuously marked with spots and longitudinal stripes of white or fawn color on a darker ground.

The habits of all the kinds of tapirs appear to be very similar. They are solitary, nocturnal, shy, and inoffensive, chiefly frequenting the depths of shady forests and the neighborhood of water, to which they frequently resort for the purpose of bathing, and in which they often take refuge when pursued. They feed on various vegetable substances, as shoots of trees and bushes, buds, and leaves. They are hunted by the natives of the lands in which they live for the sake of their hides and flesh.

TAR is a product of the destructive distillation of organic substances. It is a highly complex material, varying in its composition according to the nature of the body from which it is distilled—different products, moreover, being obtained according to the temperature at which the process of distillation is carried on. As commercial products there are two principal classes of tar in use—(1) wood tar, the product of the special distillation of several varieties of wood, and (2) coal tar, which is primarily a by-product of the distillation of coal for the manufacture of illuminating gas. These tars are intimately related to the bitumen, asphalt, mineral pitch, and petroleum obtained in very many localities throughout the world.

Wood Tar.—Wood tar, known also as Stockholm and as Archangel tar, is principally prepared in the great pine forests of central and northern Russia, Finland, and Sweden. The material chiefly employed is the resinous stools and roots of the Scotch fir (*Pinus sylvestris*) and the Siberian larch (*Larix sibirica*), with other less common fir-tree roots. A large amount of tar is also prepared from the roots of the swamp pine (*P. australis*) in North and South Carolina, Georgia, Mississippi and Alabama. In the distillation of wood a series of products, including gas, tar, pyroligneous acid and wood spirit, and charcoal may be obtained, and any of these may be the primary object of the operation. When tar is the substance sought, the ancient and crude method of working is yet largely adopted in the north of Europe. The wood to be treated is closely piled up into a huge conical stack or pile on an elevated platform, the sole of which is covered with clay and tiles. The sole slopes inward from every side to the center, where an opening communicates with a vaulted cavity under the elevated platform. The pile of the wood is closely covered over with layers of turf and earth or sand to a depth of several inches, but leaving at first near the bottom numerous apertures for the admission of air to promote ignition. The pile is ignited from below, and as the fire spreads through the heap the various apertures are closed up and a slow smoldering combustion goes on for some days till, by the sinking of the pile, the top of the stack falls in, and a bright flame springs up at that point. About ten days after ignition tar first begins to flow, and it is at once collected into barrels. According to the size of the pile, the distillation may continue several weeks, the tar secured amounting to about 17.5 per cent. of the wood operated on. In this method several valuable products—the gas, the crude pyroligneous acid, and much charcoal—are lost or wasted; and a more economical process of treating the wood in closed stills or retorts is now largely used in Russia, the gas evolved serving as fuel under the retorts. The heavier tar products of the distillation collect at the bottom of the retort, whence they are carried off by a pipe to a receiver; the volatile portion passes off at the upper part of the retort, and is separately condensed, the lightest portion passing through a worm condenser. From treatment in close retorts resinous roots yield from 16 to 20 per cent. of tar, with some oil of turpentine and pyroligneous acid.

Tar and pitch are most largely used as protective coatings for woodwork and other materials much exposed to water and the weather. Thus tar is of great value in connection with shipbuilding and shipping generally. A considerable quantity is used in manufacturing tarred ropes, and in the "smearing" of highland sheep to afford a protection against the weather. Pitch also is the basis of the Berlin black or Brunswick black used for coating cast-iron goods and for "japanning" preparations.

Coal Tar.—The art of distilling coal for the production of tar was discovered and patented by the earl of Dundonald in 1787, and till the general introduction of coal gas some amount of coal was yearly distilled in Scotland for the production of coal tar. The demand for the substance was limited, it being principally used for coating iron castings and smith work, for making an inferior lamp black, and as a source of a solvent oil. With the extensive use of coal gas the necessity for this separate distillation ceased, and soon tar was produced in the manufacture of gas in quantities that could not be disposed of. It was burned up for heating gas retorts; it was mixed with coal dust, sawdust, etc., for making patent fuel; and it was distilled for producing a series of hydrocarbon oils, heavy tar, and pitch; but it was only after the discovery and introduction of "tar-colors" that the substance came for some time to be really valuable. Since that time its price has fluctuated greatly. The various products of coal tar have all been separately treated under their own heads.

Industrial Working of Coal Tar.—Coal tar is used for a variety of purposes, such as for fuel, the tar being made into a spray by means of a steam-injector and the spray kindled; for the preservation of building materials, porous stones, and bricks, etc; for making roofing-felt; for making a low quality of lamp-black. At present, however, most of the tar produced, in centres of industry at least, is worked up by distillation. The tar as it comes from the gas works is allowed to rest in a "pond" until the tar-water (solution chiefly of ammonia and certain ammonia salts) has gone to the top. The tar proper is then pumped into a large wrought-iron still (of upright-cylinder form preferably) and therein subjected to distillation over a naked fire. A necessary preliminary, however, is the removal of the unavoidable remnant of water, which is best effected by cautiously heating the tar in the still so as to render it more fluid and enable the water to rise to the top and then letting the upper stratum run out by an overflow tap at the side. The distillation is then started. It involves the formation of two sets of volatile products, namely—(1) combustible gases (including sulphuretted hydrogen and bisulphide of carbon vapor), which must be led away to avoid nuisance and danger of fire, and (2) a very complex liquid or semi-liquid distillate. This latter is collected in successive fractions, generally in this manner:—(1) as "first runnings," what comes over at temperatures below 105° to 110° C.; (2) as "light oils," at temperatures between 110° and 210° C.; (3) as "carbolic oil," at temperatures between 210° and 240° C.; (4) as "creosote oil," at temperatures between 240° and 270° C.; (5) as anthracene oil, at temperatures above 270°; (6) a black viscid residue called hard pitch.

Hard pitch is used chiefly for making the following. (1) *Asphalt.*—The pitch is fused up—perhaps in the still which produced it—with the requisite proportion of creosote and anthracene oil, previously freed from their valuable components. Such asphalt is used for street-paving. *i.e.*, filling up the spaces between the paving-stones, and, in admixture with sand and generally more or less of natural asphalt, for the making of footpaths and floorings generally. In Germany it serves for the making of pipes for conveying acid liquids in works and chemical laboratories, etc. Endless hemp-paper is soaked in liquefied asphalt and wound spirally around an iron core, previously smeared over with soft soap, in about 100 layers. The whole is then exposed to strong pressure while still hot, and is separated from the core after being allowed to cool. Such pipes stand almost any kind of acid, but they must not be used for hot liquids. (2) *Varnishes.*—The pitch is dissolved in suitable tar oils—creosote oil for a lower and light oil for a higher quality. (3) *Coke.*—In former times more frequently than now pitch was made into coke by transferring it to a special flat still and distilling as long as any volatile products came off. The coke which remains is a very pure and consequently valuable fuel. (4) *Lamp Black* (as a last resource, if no other mode of utilization is practicable).—The pitch is subjected to partial combustion on hot iron plates and the smoke conveyed into chambers to deposit its carbon. The yield is about 40 per cent.

Anthracene Oil.—The oil is allowed to stand cold for a week or so until the anthracene has crystallized out as completely as possible. The mother-liquor is then eliminated, the bulk by means of a filter-press, the rest, at a higher than the ordinary temperature, by hydraulic pressure. The crude product includes far more than half its weight of impurities—phenanthrene, paraffin, naphthalene, etc. To remove these as far as possible, the crude anthracene is ground up and treated with petroleum spirit (boiling at 70° to 100° C.) or coal tar naphtha (120° to 190°), in which real anthracene is relatively insoluble. The insoluble part is separated by filtering arrangements and presses (so constructed as to avoid danger of fire), and at last sublimed, more with the view of bringing it into a customary convenient form than with the object of effecting further purification. Such final anthracene may contain 50 to 65 per cent. of pure substance.

Creosote Oil is either used as it is for pickling timber, softening of pitch, etc., or else redistilled to extract from it what there is of anthracene oil and carbolic acid oil, which are worked up with the respective principal quantities.

Carbolic Oil.—Assuming this oil to have been collected (as it should be if intended for the making of carbolic acid) between 170° and 230°, the process of extraction is, briefly, as follows. The oil is mixed with a suitable proportion of caustic-soda lye (ascertained by an assay) in an iron vessel at 40° to 50° C. After settling, the aqueous layer is withdrawn into a lead-lined vessel, and the soda supersaturated by sulphuric acid. Crude carbolic acid rises to the top as an oil, and is withdrawn to be sold as such or purified.

Naphthalene abounds in the oil left after extraction of the carbolic acid by caustic soda and in the more volatile fractions of the creosote oil. From these [illegible] separates out (not completely), on standing, in crystals. These are collected, best in a filter-press, and then subjected to pressure to force out the rest of the mother-liquor.

First Runnings and Light Oil.—These may be said to include all the industrially valuable "benzols" (taking "benzol" as a generic term for benzol or benzine itself and its higher homologues). As the distiller in most cases does not aim at an actual separation of all the individual benzols from one another, but at the production of certain benzol mixtures demanded by the trade, the mode of working may assume a great variety of forms; yet the first aim in all cases is the same, being the elimination of all the *non*-benzol from the given oil or oils. For this purpose the light oil is, as a rule, subjected to a preliminary fractionation over a naked fire to split it up into fractions fit to be worked for (crude) benzol, for carbolic acid, and to be incorporated with the creosote oil respectively; the carbolic acid is extracted, and the creosote-oil part put aside, and thus one or more mixtures of "benzols" are obtained.

TARAI, a British district in the Kumáun division of the lieutenant-governorship of the northwest Provinces and Oudh, India, lying between 28° 51′ and 29° 30′ N. latitude and 78° 46′ and 79° 47′ E. longitude. It contains an area of 938 square miles, and is bounded on the north by the Khumáun Bhábar, on the east by Nepál and Pilibhit subdivision of Bareilly district, on the south by the districts of Bareilly and Moradábád and the native state of Rámpur, and on the west by Bijnaur.

According to the census of 1881 the population was 206,993 (113,315 males and 93,678 females). Hindus numbered 131,966 and Mohammedans 74,982. The only town with a population exceeding 10,000 is Kásipur, with 14,667 inhabitants. The whole tendency of the population is to agricultural and not to urban life.

TARANTO. See TARENTUM.

TARANTULA. The tarantula (*Lycosa tarantula*) belongs to the mining section of the family *Lycosidæ* or Wolf Spiders. Its cephalothorax is dorsally of a brownish gray color, while the abdomen is more distinctly brown, and marked with either two or three pairs of triangular black spots above the apex of the triangles pointing backward. One of the most striking specific characteristics of this spider is a large circular black spot which covers the anterior ventral half of the abdomen, the remainder of this surface presenting an ocherous hue. The largest species does not exceed ¾ inch in length. The eight eyes are arranged in three transverse rows, the anterior containing four small eyes, while behind this two pairs of larger eyes are arranged in two rows, the eyes of the hindermost row having between them a wider interval than the first pair.

The tarantula is widely distributed in southern Europe, round the shores of the Mediterranean. It occurs throughout Spain and is found in southern France, and extends into Asia and America, a species being found in Florida, Texas, New Mexico, and other States of the Union.

TARANTISM. The tarantula has given its name to one of those dancing manias which overspread Europe during the Middle Ages. The bite of the spider threw the sufferer into a depressed state of melancholy, accompanied by various nervous disorders. The condition was accompanied by an increased sensibility to the power of music. The excitement of the nervous system amounted in some cases almost to insanity. The symptoms of the patient seem to have varied a good deal with the character of the individual attacked: the most common were a lividity of the body, icy coldness, great depression, nausea, sexual excitement, and loss of sight and hearing. The only means of arousing the sufferer from the lethargy into which he sank was music. Under the influence of this he awoke as it were, and commenced moving rhythmically, then began to dance, and continued increasing the rapidity of the motion until he fell exhausted to the ground. By this means it was considered that the poison of the tarantula was distributed through the system and worked out through the skin.

In its origin tarantism appears to have been contemporaneous with the St. Vitus' dance of Germany. It first appeared toward the end of the fourteenth century in Apulia; thence it spread gradually throughout Italy, and reached its height during the seventeenth century, by which time the dancing manias of the North had already died out. It affected not only inhabitants of the country but foreigners visiting it; age appears to have had no saving influence: children and old people alike commenced dancing at the sound of the tarantella, but as a rule women were more susceptible than men. From the seventeenth century onward it has gradually declined, and is now practically unknown, the only relic of it being the graceful dance of southern Italy called the tarantella. The bite of the tarantula is painful but not dangerous, and the real cause of the phenomena described above must be sought in the temporary epidemic prevalence of a hysterical condition.

TARARE, on the Turdine, a manufacturing town of France, and the second most populous in the department of Rhône, is twenty-five miles northwest of Lyons. Within a circle drawn twenty-five or thirty miles from the town more than 60,000 workmen are employed, and the value of the textile fabrics produced exceeds $3,000,000 per annum. An important commerce is carried on in grain, cattle, linen, hemp, thread, and leather. In 1886 the population was 11,848 (commune 12,980).

TARASCON, a town of France, in the department of Bouches-du-Rhône, is situated on the left bank of the Rhone, opposite Beaucaire, with which it is connected by a suspension and a railway bridge. It is on the Lyons and Marseilles railway, 156 miles south of the former town. The population in 1886 was 6,647 (commune 9,314).

TARAXACUM is the name usually applied in medical practice to the common dandelion (*Taraxacum officinale*, Wiggers). The DANDELION (*q.v.*) is a plant of the northern hemisphere, extending to the Arctic regions, and is cultivated in India. The preparations chiefly employed are the fluid extract, the preserved juice of the root, or succus, and the solid extract. Taraxacum is chiefly employed as a stimulant tonic in hepatic disorders. In some cases it acts as a cholagogue and mild aperient, and in others as a diuretic.

TARBES, a town of France, chef-lieu of the department of Hautes-Pyrénées, is situated in one of the most beautiful plains of France, on the left bank of the Adour, streams from which are conducted through all parts of the town. The population of the town was 24,882 in 1886.

TARENTUM, or Taras, now Taranto, a famous Greek city of southern Italy, situated on the north coast of the bay of the same name, at the entrance of the only secure port on the gulf. The modern town, in the province of Lecce, which is the see of an archbishop and had in 1881 a population of 26,611, stands on the peninsula, which is now rather an island, the isthmus connecting it with the mainland having been cut through for defense by Ferdinand I.

TARENTUM, a city of Allegheny county, Penn., ninety miles from Pittsburgh, is situated at the intersection of Bulls Creek and the western division of the Pennsylvania Central, and, in addition to being the center of a large trade, is extensively engaged in manufactures. Two weekly papers are published in the city, which also contains one bank, a graded school, five churches, an opera house, and a full complement of hotels, stores, and productive industries. Among the latter are powder, flour and saw mills, flint-glass works, paper mills, sash, door and blind, also cigar factories, and foundry and machine shops, in nearly all of which natural gas has been substituted for coal and other fuels. The population, stated at 1,200 in 1880, is now (1890) estimated at 7,000.

TARGET is a mark for aiming at in practicing with the cannon, rifle, or bow and arrow. In its more ancient meaning a target, or targe, was a shield, circular in form, cut out of ox-hide, mounted on light but strong wood, and strengthened by bosses, spikes, etc. With regard to rifle targets: The necessities are a butt, artificially constructed or cut in the face of a hill to prevent wide balls from scattering, with a marker's shot-proof cell near the targets, and a range of such length as can be procured. The sizes of targets generally used are as follows: for firing up to 300 yards the target is six feet high by four feet broad, with a circular bull's-eye one foot in diameter and a center of three feet. Up to 600 yards the target is six feet square, bull's-eye two feet in diameter, center four feet. Up to 800 yards the target is six feet by eight, bull's-eye three feet in diameter, and center five feet.

The marker signals the "hits" from his box, denoting a "bull's-eye" by a red and white flag, a "center" by a blue flag, and an "outer" by a white flag. If he show a red flag it is to cease firing while he inspects the target. In scoring the "outer" counts two, "center" three, and "bull's-eye" four. A red flag should fly on the butt during the whole time of firing to warn passers-by to keep off the range. The target above described is the military target now generally used.

The targets used by the various rifle associations are not the same as those used by the military. According to the Wimbledon regulations the target for the distance of 200 yards had a circle of forty inches in diameter, divided into the circular bull's-eye eight inches in diameter, a center of sixteen inches diameter, an inner of twenty-eight inches, the rest of the forty inches being accounted "outer." On the target for 500 or 600 yards the circle of sixty inches falls on the bull's-eye of twenty-two inches diameter, center thirty-eight inches, inner fifty-four inches, and the rest outer.

The frame for 800, 900, and 1,000 yards' distance had a circular bull's-eye of three feet in diameter, a center four feet six inches, a square inner of six inches, the remainder of the target counting as outer. The latest modification of the Wimbledon is the introduction of a space for "magpie" between the inner and the outer. Targets were first made of wood, then of iron, but the usual target now is of canvas stretched on an iron frame.

TARES, or Vetches. See Agriculture.

TARGUM (תַּרְגּוּם) in its concrete sense signifies the paraphrastic translation of the Hebrew Scriptures, or parts thereof, into the Aramaic tongue. It has, however, three other meanings—(1) a translation from any language into another; (2) an interpretation in any language; and (3) the Aramaic portions of certain books of the Bible (notably Daniel and Ezra).

Origin.—Although none of the Targums now in our hands are as old as the Septuagint (*q.v.*), the public use of Targums on Sabbaths, festivals, etc., is very ancient, and indeed their language was for several hundreds of years the sole one understood by the majority of the Jews in Palestine and Babylonia. How the Hebrew people af Judæa came so entirely to unlearn their own Hebrew tongue as to stand in need of an Aramaic translation of their Scriptures need not be dwelt on here. But an important contrast between the Aramaic and Greek versions deserves particular notice. The use of the Septuagint by the Greek-speaking Jews of Alexandria, Asia Minor, and elsewhere caused those who adopted it to forget entirely their own Hebrew tongue. The Aramaic version (Targum), however, springing from a religious necessity, was the cause of revival of the knowledge of Hebrew, which had been nigh forgotten. It is therefore easy to understand why the Jews in general have shown comparatively little attachment to the Septuagint, while they ever ardently revered the Aramaic version, even after the institution of publicly reciting it had ceased. To this day pious Jews privately prepare themselves every Friday for the lessons of the coming Sabbath by reading the weekly portion twice in the sacred text and once in the Targum.

Authorship and Age of the Various Targums.—The Targums on the various books of the Bible are not merely by various authors, but also of various ages. They have only one thing in common—all of them rest on oral traditions, which are hundreds of years older than the earliest form of the written Targums.

TARIFA, a seaport of Spain, in the province of Cadiz, at the extreme south point of the peninsula, fifty-nine miles southeast from Cadiz and (by land) twenty-one miles west-southwest from Gibraltar. The population within the municipal limits was 12,234 in 1877.

TARIFF, The, is a table of charges allowed on merchandise manufactured in one country for the privilege of introducing it into another country, such charges being regulated by commercial policy, national interests, and the wants of the community. The word is derived from "Tarifa," the most southern town of Europe, where, during the rule of the Moors of Spain, duties were collected on merchandise in ships passing through the Straits of Gibraltar.

The history of tariff legislation in the United States began immediately at the close of the Revolutionary war. At that date the right to assess duties upon imports was conceded to, and exercised by, each of the original thirteen States. Its administration, however, was not without friction between the States, and the constitution of 1789 provided for the future exercise of this right by the general government exclusively. The same year a bill was introduced in Congress, providing for the levying of import duties as a means of encouraging and protecting the infant industries of the republic. The bill was adopted and the policy of subsequent legislation was in the direction of a steady increase of import duties. At that early day there was little opposition to such a policy, for there seems to have been an opinion among men of all parties, that a protective tariff was necessary for the development of home industries, as a measure of rendering the country independent of foreign supplies. So pronounced was this opinion that when the war of 1812 broke out, the duties were measurably increased and extended. That war has been described by a number of writers upon the American tariff system as the author of "the American factory system," in that it "acted as a prohibitory tariff on British goods, and forced Americans to begin making for themselves what they had been buying abroad." Tariff legislation was had in 1816, 1824 and 1828, the policy of increased duties being adhered to, notwithstanding the opposition of the South, where the principles of protection had meanwhile been abandoned and those strongly allied to free-trade substituted. This change of base was due, as was then claimed, to the fact that the South was made up of States adapted exclusively to agricultural development, and that manufactures were consequently impracticable. This feeling of opposition was further strengthened by England's removal in 1832 of the duty she had theretofore demanded upon American cotton. The same year a revision of the tariff was made and some of the features alleged to impose hardships upon the South were amended or eliminated. Portions of the South, however, proposed to repudiate the tariff laws, and prevent the collection of the tariff duties, but President Jackson put a period to the application of the doctrine of nullification in the most decided manner. In 1833 the tariff was again reduced and the panic of 1837 was by many attributed to such reduction, while others maintained with equal emphasis that the hard times which prevailed in that year were due entirely to the fever of speculation which was then epidemic all over the land. It might here be said that tariff revision was inaugurated about this time, and that this question has been the most frequently and intelligently debated (as has been said by a leading representative of the policy of protection) of any presented to the American people since the foundation of the government.

The revision of 1833 contained a provision stipulating for a gradual reduction of duties up to September 30, 1842, after which none of them were to exceed 20 per cent. ad valorem. In the latter year the tariff was yet again revised, and many of the reductions previously perfected repealed. This was brought about by the statesmen who contended that the American market must be preserved for the products of American labor, and that this could be accomplished only by levying high duties on articles of foreign manufacture, their opponents insisting that high duties were unjust to American consumers without conferring any corresponding benefit upon manufacturers.

In 1846 Robert J. Walker, secretary of the treasury during the Polk administration, formulated a plan of tariff revision, which was incorporated in a bill adopted by both houses of congress, and with some slight changes subsequently made, remained in force until 1861. Walker's bill was based upon the premises that duties assessed and collected should not be greater than was necessary to an economical administration of the government; that no duty should be imposed upon any article above the lowest rate that would yield the largest amount of revenue; that the maximum of duties should be assessed upon luxuries; that below certain rates discriminations should be made, and for imperative reasons the article be placed on the free list; the abolition of specific and substitution of ad valorem duties, and that the duty be so imposed as to operate throughout the union without discriminating for or against any class or section.

In 1857 the duties were in some particulars once more reduced, but in 1860 the rates of 1846 were restored by the provisions of the Morrill act. Subsequent legislation was had with the effect of increasing the duties and otherwise adding to the revenues of the government, a line of policy necessitated by expenses incurred in the conduct of the war. At the close of the war the internal revenue taxes were abolished and efforts were made, notably by David A. Wells, commissioner of internal revenue, for a reduction of the then existing tariff rates. In 1872 coffee and tea were placed upon the free list, and rates on other necessaries were reduced, while times were good and wages between 1863 and 1872 increased. These latter incidents, it is claimed by some, were the results of protection, others as stoutly maintaining they were caused by paper inflation. Early in the eighties a commission of senators and congressmen was appointed to investigate the subject and prepare a tariff, and in 1883 the result of the commission's investigation found expression in a general revision of the entire system. Later, Representative Morrison introduced a bill in the House for "a reduction of rates all around," but nothing came of it, the bill sustaining defeat in December, 1886. The next year President Cleveland, in his annual message to Congress, dealt wholly with the question of tariff revision and reduction, and recommended that legislation in that behalf be had without delay. The suggestion of the executive was adopted, and during the session of the Fiftieth Congress the Hon. Roger Q. Mills of Texas, as chairman of the Committee on Ways and Means, prepared and introduced a bill in the House, providing for the reduction of duties on certain articles and the putting of other articles on the free-list. This bill was known as the "Mills Bill," and was adopted in the House. The Senate, however, refused to pass the bill, offering a substitute therefor, but Congress again adjourned without having accomplished anything in the way of "tariff revision or reform." The Mills bill was, the summer following, adopted as the campaign shibboleth of one of the great political parties of the country, with results that included the defeat of that party, and the subsequent reversal of the party's majority in the House. In the Fifty-first Congress the Hon. William McKinley of Ohio, chairman of the Ways and Means Committee of the House, introduced a bill which, as amended, became a law in 1890.

TARN-ET-GARONNE, a department of southwestern France, was formed in 1808 of districts formerly belonging to Guienne and Gascony (Quercy, Lomagne, Armagnac, Rouergue, Agenais), with the addition of a small piece of Languedoc. From 1790 to 1808 it was divided between the departments of Lot, Haute-Garonne, Tarn, Aveyron, Gers, and Lot-et-Garonne.

Tarn-et-Garonne is one of the least densely peopled departments of France: in 1886 there were 214,046 inhabitants, and their number is decreasing. The department forms the diocese of Montauban, and belongs to the jurisdiction of the Toulouse court of appeal and to the district of the seventeenth corps d'armée (Toulouse). It has 3 arrondissements (Montauban, Moissac, and Castel-Sarrasin), 24 cantons, and 194 communes.

TARNOPOL, a market-town in Galicia, Austria, on the Sereth. It was formerly a fortress, and rendered valuable services to Polish kings, who, in their turn, conferred upon it important privileges. The town enjoys a brisk trade in grain and wine, and has some sugar factories. Its yearly horse fairs are famous throughout the country. The population in 1885 was 27,000, about half of them Jews.

TARPAULIN is a waterproof sheeting consisting of a stout canvas cloth impregnated and coated with tar. It is employed for covering hatchways and other openings into the holds of vessels, for making covers for railway and other wagons and farm ricks, and generally for protecting bulky goods and structures from weather and damp. Many waterproof compositions other than tar are used for similar purposes, the principal ingredients being solutions of india-rubber, gutta-percha, and various resinous bodies combined with pigments. (See WATER-PROOFING.)

TARQUINII. See ETRURIA.

TARQUINIUS PRISCUS, LUCIUS, fifth legendary king of Rome, is represented as the son of a Greek refugee who removed from Tarquinii in Etruria to Rome, by the advice of his wife, the prophetess Tanaquil. Appointed guardian to the sons of Ancus Marcius, he succeeded in supplanting them on the throne on their father's death. It was he who first established the Circus Maximus, built the great cloacæ, and founded the triple temple on the Capitol—the expense of these vast works being defrayed by plunder seized from the Latins and Sabines. Many of the ensigns both of war and of civil office are assigned to his reign, and he was the first to celebrate a Roman triumph. After a reign of thirty-eight years he was assassinated.

TARQUINIUS SUPERBUS, LUCIUS, son of the preceding, and son-in-law of Servius Tullius, immediately succeeded the latter without any of the forms of election, and proceeded at once to repeal the recent reforms in the constitution, seeking to establish a pure despotism in their place. His reign was characterized by bloodshed and violence; the outrage of his son Sextus upon Lucretia precipitated a revolt, which led to the expulsion of the entire family, after Tarquin had reigned twenty-five years.

TARRAGONA, a maritime province in the northeast of Spain, with an area of 2,451 square miles, and a population in 1877 of 330,105, was formerly part of the province of Catalonia. It is bounded on the southeast by the Mediterranean, on the northeast by Barcelona, on the north by Lerida (the Sierra de Almenar), on the west by Saragossa and Teruel, and on the southwest by Castellon-de-la-Plana. Besides the capital, the towns in the province with more than 10.000 inhabitants are Reus (27,691), Tortosa (23,808), and Valls (13,256).

TARRAGONA, the capital of the above province, is a flourishing seaport, the seat of an archbishopric, at the mouth of the Francoli, sixty-three miles by rail west-southwest of Barcelona, in 41° 10′ N. latitude and 0° 20′ E. longitude, with a population of 23,046 in 1877.

TARRYTOWN, one of many beautiful villages which dot the landscape of New York State in almost every direction, is handsomely situated on the hillside overlooking the Hudson river at Tappan Sea. The village has been made memorable in both history and romance; for it was in the vicinity of Tarrytown that André was captured and Rip Van-Winkle endured his martyrdom. It is twenty-seven miles from New York and 116 miles from Albany, with both of which cities it is connected by rail and river steamers. In addition to its attractions as a place of residence, the village contains many evidences of financial and commercial prosperity as also of the intelligence and refinement of the inhabitants. They include two banks, three weekly papers, an academy, Cottage Hill Seminary, ten churches, etc., also having flour mills, blank-book, boot and shoe, cigar, canned goods, and sash, door, and blind factories. North and East Tarrytown, adjoining the village, are prosperous suburbs. The popoulation in 1890 was 3,901.

TARN, a department of southern France, formed in 1790 of the three dioceses of Albi, Castres, and Lavaur, all belonging to the province of Languedoc, lies between 42° 23′ and 44° 12′ N. lat. and 1° 32′ and 2° 56′ E. long. It is bounded north and east by Aveyron, southeast by Hérault, south by Aude, southwest and west by Haute-Garonne, northwest by Tarn-et-Garonne. The population of the department in 1886 was 358,757.

TARSHISH. See PHŒNICIA.

TARSUS, now TARSÚS, an ancient city in the fertile plain of Cilicia, lay on both sides of the Cydnus, whose cool and swift waters were the pride of the city and bore traffic to and from the port of Rhegma. In the time of Xenophon (*Anab.*, i. 2. 23), Tarsus was already great and flourishing, and was the residence of the vassal king of Cilicia. Its civilization at this time seems to have been mainly Semitic, as was to be expected from the geographical relations of Cilicia, which have generally associated its history with that of Syria. The city was deserted and lay waste during the frontier wars of Greeks and Arabs in the first century of Islam; a Moslem general, who saw the ruins, estimated its former population at 100,000. It was rebuilt and settled as a military colony and frontier post by Hárún al-Radíll in 787 A.D., and became a starting point of forays against the Christians.

TARTAGLIA, NICCOLÓ, a self-taught mathematician, was born at Brescia about 1500. He died at Venice December 13, 1557. Acrid and emulous in disposition, he incurred abundant enmities; yet his honesty, uprightness, and the morality of his life remain unimpeached. He was keen-witted, diligent, and ingenious, and by his discoveries in the solution of equations helped to initiate the rapid progress of modern mathematics.

TARTAN is a worsted cloth woven with alternate stripes or bands of colored warp and weft, so as to form a checkered pattern in which the colors alternate in "sets" of definite width and sequence. The weaving of particolored and striped cloth cannot be claimed as peculiar to any special race or country, for indeed such checks are the simplest ornamental form into which dyed yarns can be combined in the loom. But the term tartan is specially applied to the variegated cloth used for the principal portions of the distinctive costume of the Highlanders of Scotland. For this costume, and the tartan of which it is composed, great antiquity is claimed, and it is asserted that the numerous clans into which the Highland population were divided had each from time to time a special tartan by which it was distinguished.

TARTAR, a mixture of bitartrate of potash and tartrate of lime, is a deposit formed from wine, and known in its crude form as Argol. The word Tartar, which gives the name to tartaric acid, is derived from the Greek (Ταρταρός), hell.

TARTAR OF THE TEETH, is a deposit of salts of lime and organic matter from the saliva, and usually occurs most abundantly on the lower front teeth. The accumulation of this substance may be prevented if due attention is paid to the cleaning of the teeth, but when it has accumulated to any extent it must be removed by the scaling instruments of the dentist.

TARTAR, SOLUBLE, a term sometimes applied to neutral tartrate of potash, and by others to borotartaric acid.

TARTARIC ACID, in its ordinary acceptation, refers to one acid, $(C_4H_4O_6)H_2$, which occurs in most acid fruit juices, in association generally with malic or citric, or both. Grape-juice owes its sourness almost entirely to acid tartrate of potash. While the juice ferments into wine, the greater part of the acid tartrate separates out, along with tartrate of lime, coloring matter, and other impurities, as a hard crust adhering to the sides of the cask. Such impure acid tartrate of potash is known commercially as "argol." It was known to the Greeks as τρύξ to the Romans as *fæx vini.* The alchemists from the eleventh century called it *tartarus*, which name has survived in familiar chemical parlance to this day. The true constitution of *tartarus vini* was discovered by Scheele in 1769. He was the first to isolate the acid from its acid potash salt by a method which is still used for its industrial extraction.

Manufacture.—Crude tartar (ten to fourteen hundredweights) is placed in a tank, and dissolved in sufficient water with the help of steam. The surplus acid is then neutralized by addition of powdered chalk, and precipitated as lime salt. The other half of the tartaric acid which remains dissolved as normal potash salt is then precipitated in the same form by addition of chloride of calcium. The tartrate of lime precipitate is collected, washed, and decomposed by an excess of sulphuric acid at 75° C. The sulphate of lime is removed by decanting and filtering, and the acid solution evaporated in leaden pans to a sufficient degree to deposit crystals on standing in the cold. The crystals are purified by redissolving them in hot water, decolorizing the solution with animal charcoal, and causing the acid to crystallize a second time after addition of sulphuric acid, which promotes the formation of large crystals. The crystals contain a little sulphuric acid and a trace of lead; if intended for internal use, they must be recrystallized from pure water.

Tartaric acid is used largely in calico printing as a discharge. In pharmacy and households it serves, conjointly with bicarbonate of soda or potash, for the extemporaneous preparation of effervescing drinks. The so-called German effervescing powders are a combination of weighed-out doses of tartaric acid and of bicarbonate of soda.

TARTARY (or more correctly TATARY), is the name under which, in the middle ages, was comprised the whole central belt of Central Asia, and Eastern Europe, from the Sea of Japan to the Dnieper, including Mantchuria, Mongolia, Chinese Turkestan, Independent Turkestan, the Kalmuck, and Kirghis steppes, and the old Khanates of Kasan, Astrakhan, and the Crimea, and even the Cossack countries; and hence arose a distinction of Tartary into European and Asiatic. But latterly the name of Tartary had a much more limited signification, including only that tract bounded on the north by Siberia and on the south by China and Thibet, along with Independent Turkestan, and at the present day many writers apply it as a synonym for Turkestan.

TARTARS (more correctly TATARS, but Tartars is the form generally current), a name given to nearly three million inhabitants of the Russian empire, chiefly Moslem and of Turkish origin. The majority—in European Russia—are remnants of the Mongol invasion of the thirteenth century (see MONGOLS), while those who inhabit Siberia are survivals of the once much more numerous Turkish population of the Ural-Altaic region, mixed to some extent with Finnish and Samoyedic stems, as also with Mongols. The name is derived from that of the Ta-ta Mongols, who in the fifth century inhabited the north-eastern Gobi, and, after subjugation in the ninth century by the Tungus Kidañs, migrated southward, there founding the Mongolian empire under JENGHIZ KHAN. Under the leadership of his grandson (Batu) they moved westward, driving with them many stems of the Turkish Ural-Altaians toward the plains of Russia. The ethnographical features of the present Tartar inhabitants of European Russia, as well as their language, show that they contain no admixture (or very little) of Mongolian blood, but belong to the Turkish branch of the Ural-Altaic stock, necessitating the conclusion that only Batu, his warriors, and a limited number of his followers were Mongolians, while the great bulk of the thirteenth-century invaders were Turks. On the Volga they mingled with remnants of the old Bulgarian Turkish empire, and elsewhere with Finnish stems, as well as with remnants of the ancient Italian and Greek colonies in Crimea and Caucasians in Caucasus. The name of Tatars, or Tartars, given to the invaders, was afterward extended so as to include different stems of the same Turkish branch in Siberia, and even the bulk of the then little known inhabitants of the high plateau of Asia and its north-western slopes, which was described under the general name of Tartary. This last name has almost disappeared from geographical literature, but the name Tartars, in the above limited sense, remains in full use.

TARTARUS, in the *Iliad*, is a dark underground prison with iron gates, as far below Hades as earth is below Heaven, whither Cronus and the Titans were thrust down by Zeus, and to which the sovereign of Olympus threatens to consign other gods who may disobey his behests. Later writers make Tartarus the place of punishment of the wicked after death.

TARTINI, GIUSEPPE, violinist, composer, and musical theorist, was born at Pirano, April 12, 1692. He studied for some time at Ancona, and here, about 1714, he made the curious acoustical discovery on which his fame as a theorist chiefly rests. He observed that, when two notes are sounded together on the violin with sufficient intensity, a third sound, distinct from both, is simultaneously produced. For the production of this "third sound," as he called it, Tartini failed to account on strict mathematical principles. When the two primary notes form an impure consonance, the "third sound" of Tartini (now known as a difference tone of the first order) is accompanied by beats due to the presence of different tones of higher orders, the existence of which, unknown of course to Tartini, has been established by Helmholtz. Tartini made his observations the basis of a theoretical system which he set forth in his *Trattato di Musica, secondo la vera scienzia dell' Armonia* (Padua, 1754) and *Dei Principij dell' Armonia Musicale* (Padua, 1767). In 1721 he went to Padua, where he was appointed solo violinist at the church of San Antonio. From 1723 to 1726 he acted as conductor of Count Kinsky's private band, but afterward returned to his old post at Padua, where he died on February 16, 1770.

TARUDANT. See MOROCCO.

TASHKEND, or TASHKENT, one of the largest and most important cities of Central Asia, now the capital of Russian Turkestan, is situated in the valley of the Tchirtchik, some fifty miles above its junction with the Syr-Daria, in 41° 20′ N. latitude and 69° 18′ E. longitude. According to the most recent estimates, the population of Tashkend, with its suburbs, is reckoned at 100,000.

TASMAN, ABEL JANSZEN, a distinguished Dutch navigator, born at Hoorn, North Holland, probably in 1602 or 1603. In 1642 he set out on his great voyage of discovery. Sailing from Batavia on August 14, 1642, with two vessels, the *Heemskirk* and *Zeehaan*, Tasman on November 24th sighted the land to which he gave the name of Van Diemen, in honor of the governor-general, but which is now named Tasmania. He doubled the land, which he evidently did not know was an island, and, running up Storm Bay, anchored on December 1st in the bay to which he gave the name of Frederick Henry. There he set up a post on which he hoisted the Dutch flag. Quitting Van Diemen's Land on December 5th, Tasman steered eastward with a vague idea of reaching the Solomon Islands, and on December 13th he discovered a "high mountainous country," which he called "Staatenland" (New Zealand). Cruising along the west coast of the South Island, he anchored on the 18th in 40° 50′ S. latitude, at the entrance of a "wide opening," which he took to be a "fine bay," but which was no doubt Cook's Strait. He gave the name of Moordenaars (Massacre) Bay to the bay, at which he attempted to land, and where several of his men were killed by the natives. Leaving New Zealand, and pursuing an irregularly north direction, but never coming in sight of Australia, he discovered, on January 21, 1643, two islands belonging to the Friendly group, to which he gave the names of Middelburg (Eova) and Amsterdam (Tongatabu). After discovering several other islands in the Friendly group and their neighborhood, Tasman steered north and west, reaching the neighborhood of New Britain on March 22d. On the 24th he passed Morghen Islands, and, sailing round New Ireland and along the north coast of New Guinea, he cleared the straits between New Guinea and Jilolo, arriving at Batavia on June 15th, after a ten months' voyage. Tasman rightly ranks as one of the greatest navigators of the seventeenth century. He died at Batavia in October, 1659.

TASMANIA, formerly Van Diemen's Land, is a compact island, forming a British colony, which lies to the south of Australia, in the Southern ocean. It has an area of 24,600 square miles (about three-fourths of the size of Ireland), and some fifty islets belong to it. Most of these lie between it and the southern shore of Victoria, in Bass' Strait. The colony is divided into eighteen counties. The principal towns are Hobart, the capital, on the Derwent, with a population of 21,118 in 1881; (25,044 in 1886), and Launceston (12,752 in 1881; 19,379 in 1886), at the head of the Tamar. The rugged western half of the island has only a few small settlements, while the eastern country is increasing in population on account of the mines.

Climate.—This small colony has a far greater range of climate than can be experienced throughout the Australian continent. The eastern side is dry; the western is very wet. Dense forests and impracticable scrubs result in the west from deposition of a hundred or more inches of rain in the year, while other parts to the east occasionally suffer from drought. Tasmania does not escape the summer visit of an Australian hot wind. Hobart and Launceston, being near the sea, have greater equability of temperature, with rare frosts. The mean temperature of Hobart is 54°, of Waratah in the northwest 44°. Hobart averages twenty-two inches of rain, less than Melbourne, Sydney, and Brisbane. Inland, in the settled parts, cold is severe in winter, but only for a short period. The wooded northwest shore has no cold and no excessive heat, but plenty of showers. Up in the lake country the climate rather resembles the Highlands of Scotland. On the west and southern coasts the winds are usually strong, and often tempestuous.

Like New Zealand, Tasmania is very healthy. No miasma is retained in its forests. Rheumatism and colds may prevail, but little fever or dysentery occurs. Perhaps no part of the world can show relatively so many aged people. Children generally display the robustness of English village life. As a retreat for Australians, Tasmania in the summer has strong claims. Cool and strengthening airs, magnificent forest solitudes, and secluded fern-tree vales may be enjoyed along with all the comforts of modern civilization.

Minerals.—Arsenic and silver are found with gold in the northeast; and iron, arsenic, copper, and lead with it at Beaconsfield. Silver occurs at Penguin, Mount Ramsey, and Waratah (Mount Bischoff), combined with lead. Copper is met with at Mount Maurice, etc., but not in paying quantities. Bismuth at Mount Ramsey is rich, but the country is difficult to reach. Antimony, zinc, manganese, copper, plumbago, and galena are known west of the Tamar, where also asbestos in serpentine hills is plentiful. Tin is well distributed in Tasmanian granite. Mount Bischoff, in the scrubby, rocky, damp west, has the richest lodes; other mines are in the northeast and west. Want of water in the northeast prevents much hydraulic working. Anthracite coal is pretty abundant at Port Arthur. Fingal district has coal equal to that of Newcastle, with a seam of fourteen feet, but carriage is difficult. Mersey river coal mines yielded 60,000 tons in the course of over a dozen years. Iron was worked near the Tamar, but did not pay, excess of chromium making it brittle; its steel was very malleable. All varieties of iron ores are known. Hobart freestone is largely exported to other colonies. Tasmanite or dysodile in the Mersey district is an inflammable, resinous substance.

Agriculture.—The island has not a large area fit for cultivation. A great part is very mountainous; and dense scrubs, with heavy forests, are impediments to the farmer. The west side is too wet, stormy, and sterile for settlement. Almost all the farms lie in the line between Hobart and Launceston and between Launceston and Circular Head. The climate being cooler and moister than in most parts of Australia, the productions are of an English character, hops, barley, and oats being freely raised. Cropping land for many successive years with wheat has lessened the produce of what was fertile country, as little manure had been used. In later times there has been a great improvement in agriculture. For some time Tasmanian growers did well, supplying Australia and New Zealand with flour, potatoes, and fruit; but, as their customers became in their turn producers, the old markets failed in all but apples and stone fruit. Fresh and preserved fruit, with jams, together with excellent hops, continue to afford the islanders a good trade.

Commerce.—Soon after the colony was founded there was a great trade in whale oil, as well as in the oil and skins of seals. When this declined, merchants did well in the exportation of breadstuffs, fruits, and vegetables to the neighboring and more recently established colonies, not less than to New South Wales. Timber was also freely sent to places less favored with forests or too busy with other employments. When the trade with England in oil fell off, the export in wool and then of metals succeeded. Tasmania has now an active commerce with Victoria; but has a competitor rather than a customer in New Zealand.

Administration.—The governor is appointed by the British crown. The legislative council has eighteen members, and the assembly thirty-six. The revenue for 1888–89 was $3,2000,000, the expenditure, $3,500,000. The public debt, contracted for public works, amounts to $22,000,000. The customs provided $1,500,000. The official machinery is as extensive as for a colony with seven or eight times the population.

Population.—The whites have entirely displaced the blacks. Outrages and cruelties led to conflicts; and now the last individual of the tribes has passed away. There are, however, some half-castes on islands in the straits. The colonists in Tasmania are more concentrated than in other settlements. In 1818 there were 2,320 men, 432 women, and only 489 children. At the census of 1889 the population numbered 146,149.

TASSIE, James, Scottish gem-engraver and modeler, was born of humble parentage at Pollokshaws, near Glasgow, in 1735.

In addition to his impressions from antique gems, Tassie executed many large profile medallion portraits of his contemporaries, and these form the most original and definitely artistic class of his works. They were modeled in wax from the life or from drawings done from the life, and—when this was impossible—from other authentic sources. They were then cast in white enamel paste, the whole medallion being sometimes executed in this material; while in other cases the head only appears in enamel, relieved against a background of ground-glass tinted of a subdued color by paper placed behind. His first large enamel portrait was that of John Dolbon, son of Sir William Dolbon, Bart., modeled in 1793 or 1794; and the series possesses great historic interest, as well as artistic value, including as it does portraits of Adam Smith, Sir Henry Raeburn, Drs. James Beattie, Blair, Black and Cullen, and many other celebrated men of the latter half of the eighteenth century.

At the time of his death, in 1799, the collection of Tassie's works numbered about 20,000 pieces.

TASSIE, William, gem-engraver and modeler, nephew of the above, was born in London on December 4, 1777. He died at Kensington on October 26, 1860, and bequeathed to the Board of Manufactures, Edinburgh, an extensive and valuable collection of casts and medallions by his uncle and himself.

TASSO, Torquato, who ranks with Dante, Petrarch, and Ariosto among the first four poets of Italy, was the son of Bernardo Tasso, a noblemen of Bergamo. He was born at Sorrento in 1544. Torquato was sent to study law at Padua. Instead of applying himself to law, the young man bestowed all his attention upon philosophy and poetry. Before the end of 1562 he had produced a narrative poem called *Rinaldo*, which was meant to combine the regularity of the Virgilian with the attractions of the romantic epic. After the publication of *Rinaldo* he had expressed his views upon the epic in some *Discourses on the Art of Poetry*, which committed him to a distinct theory and gained for him the additional celebrity of a philosophical critic. The age was nothing if not critical; but it may be esteemed a misfortune for the future author of the *Gerusalemme* that he should have started with pronounced opinions upon art. Essentially a poet of impulse and instinct, he was hampered in production by his own rules.

The five years between 1565 and 1570 seem to have been the happiest of Tasso's life, although his father's death, in 1569, caused his affectionate nature profound pain. The most important events in Tasso's biography during the following four years are the publication of the *Aminta*, in 1573, and the completion of the *Gerusalemme Liberata*, in 1574. The *Aminta* is a pastoral drama of very simple plot, but of exquisite lyrical charm. It appeared at the critical moment when modern music, under Palestrina's impulse, was becoming the main art of Italy. The honeyed melodies and sensuous melancholy of *Aminta* exactly suited and interpreted the spirit of its age. We may regard it as the most decisively important of Tasso's compositions, for its influence, in opera and cantata, was felt through two successive centuries. The *Gerusalemme Liberata* occupies a larger space in the history of European literature, and is a more considerable work. Yet the commanding qualities of this epic poem, those which revealed Tasso's individuality, and which made it immediately pass into the rank of classics, beloved by the people no less than by persons of culture, are akin to the lyrical graces of *Aminta*. It was finished in Tasso's thirty-first year; and when the MS. lay before him the best part of his life was over, his best work had been already accomplished.

Meanwhile, through the years 1575, 1576, 1577, Tasso's health grew worse. He became the subject of delusions—thought that his servants betrayed his confidence, fancied he had been denounced to the Inquisition, expecting daily to be poisoned. In the autumn of 1576 he quarreled with a Ferrarese gentleman, Maddalo, who had talked too freely about some love affair; in the summer of 1577 he drew his knife upon a servant in the presence of Lucrezia d'Este, duchess of Urbino. For this excess he was arrested; but the duke released him, and took him for change of air to his country seat of Belriguardo. What happened there is not known. Some biographers have surmised that a compromising *liaison* with Leonora d'Este came to light, and that Tasso agreed to feign madness in order to cover her honor. But of this there is no proof. It is only certain that from Belriguardo he returned to a Franciscan convent (St. Anna), at Ferrara, for the express purpose of attending to his health. There the dread of being murdered by the duke took firm hold on his mind. He escaped at the end of July, disguised himself as a peasant, and went on foot to his sister at Sorrento.

The truth seems to be that Tasso, after the beginning of 1575, became the victim of a mental malady, which, without amounting to actual insanity, rendered him fantastical and insupportable, a misery to himself and a cause of anxiety to his patrons. There is no evidence whatsoever that this state of things was due to an overwhelming passion for Leonora. The duke, instead of acting like a tyrant showed considerable forbearance. He was a rigid and not sympathetic man, as egotistical as a princeling of that age was wont to be. But to Tasso he was never cruel—hard and unintelligent perhaps, but far from being that monster of ferocity which he has been painted.

In 1586 Tasso left St. Anna at the solicitation of Vincenzo Gonzaga, prince of Mantua. He followed his young deliverer to the city by the Mincio, basked awhile in liberty and courtly pleasures, enjoyed a splendin reception from his paternal town of Bergamo, and produced a meritorious tragedy called *Torrismondo*. But only a few months had passed when he grew discontented. Vincenzo Gonzaga, succeeding to his father's dukedom of Mantua, had scanty leisure to bestow upon the poet. Tasso felt neglected. In the autumn of 1587 we find him journeying through Bologna and Loreto to Rome, and taking up his quarters there with an old friend, Scipione Gonzaga, now patriarch of Jerusalem. Next year he wandered off to Naples, where he wrote a dull poem on *Monte Oliveto*. In 1589 he returned to Rome, and took up his quarters again with the patriarch of Jerusalem. The servants found him insufferable, and turned him out of doors. He fell ill, and went to a hospital. The patriarch in 1590 again received him. But Tasso's restless spirit drove him forth to Florence. The Florentines said, *Actum est de eo*. Rome once more, then Mantua, then Florence, then Rome, then Naples, then Rome, then Naples—such is the weary record of the years 1590–94. We have to study a veritable Odyssey of malady, indigence, and misfortune. To Tasso everything came amiss. He had the palaces of princes, cardinals, patriarchs, nay popes, always open to him. Yet he could rest in none. To rest would have been so easy, had he possessed the temperament of Berni or of Horace. But he was out of joint with the world. No sensuous comforts, no tranquillity of living, soothed his vexed soul. Gradually, in spite of all veneration for the *sacer vates*, he made himself the laughing-stock and bore of Italy.

His health grew ever feebler and his genius dimmer. In 1592 he gave to the public a revised version of the *Gerusalemme*. It was called the *Gerusalemme Conquistata*. All that made the poem of his early manhood charming he rigidly erased. The versification was degraded; the heavier elements of the plot underwent a dull rhetorical development. During the same year a prosaic composition in Italian blank verse, called *Le Sette Giornate*, saw the light. Nobody reads it now. We only mention it as one of Tasso's dotages—a dreary amplification of the first chapter of Genesis.

It is singular that just in these years, when mental disorder, physical weakness, and decay of inspiration seemed dooming Tasso to oblivion, his old age was cheered with brighter rays of hope. Clement VIII. ascended the papal chair in 1592. He and his nephew, Cardinal Aldobrandini of St. Giorgio, determined to befriend our poet. In 1594 they invited him to Rome. There he was to assume the crown of bays, as Petrarch had assumed it, on the Capitol. Lean and worn out with sickness, ready to totter into the tomb, where rest might possibly be found, Tasso reached Rome in November. The ceremony of his coronation was deferred because Cardinal Aldobrandini had fallen ill. But the pope assigned him a pension; and, under the pressure of pontifical remonstrance, Prince Avellino, who held Tasso's maternal estate, agreed to discharge a portion of his claims by payment of a yearly rent-charge. At no time since Tasso left St. Anna had the heavens apparently so smiled upon him. Capitolian honors and money were now at his disposal. Yet this good fortune came too late. It seemed as though fate had decided that this man, in all his weakness of character and pathetic grace of genius, should win the stern fame of martyrdom. Both laurel wreath and wealth must be withdrawn from him. Before the crown was worn or the pensions paid he ascended to the convent of St. Onofrio, on a stormy 1st day of April in 1595. Seeing a cardinal's coach toil up the steep Trasteverine Hill, those good monks came to the door to greet it. From the carriage stepped Tasso, the Odysseus of many wanderings and miseries, the singer of sweetest strains still vocal, and told the prior he was come to die with him.

In St. Onofrio he died, on April 25th of that year, 1595. He was just past fifty-one; and the last twenty years of his existence had been practically and artistically ineffectual. At the age of thirty-one the *Gerusalemme*, as we have it, was accomplished. The world, too, was already ringing with the music of *Aminta*. More than this Tasso had not to give to literature. But those succeeding years of derangement, exile, imprisonment, poverty, and hope deferred endear the man to us. Elegiac and querulous as he must always appear, we yet love Tasso better because he suffered through nearly a quarter of a century of slow decline and unexplained misfortune.

TASSO, Bernardo, an Italian poet of considerable distinction, most famous as the father of the illustrious Torquato Tasso, was born at Bergamo, November 11, 1493, and died September 4, 1569, at which time he was the governor of the city of Ostiglia.

TASSONI, Alessandro, Italian poet, was a native of Modena, where he was born in 1565, and where he died in 1635.

TASTE is the sensation referred to the mouth when certain soluble substances are brought into contact with the mucous membrane of that cavity. The sense is located almost entirely in the tongue. Three distinct sensations are referable to the tongue—(1) taste, (2) touch, and (3) temperature. The posterior part of its surface, where there is a Λ-shaped group of large papillæ, called circumvallate papillæ, supplied by the glosso-pharyngeal nerve, and the tip and margins of the tongue, covered with filiform (touch) papillæ and fungiform papillæ, are the chief localities where taste is manifested, but it also exists in the glosso-palatine arch and the lateral part of the soft palate. The middle of the tongue and the surface of the hard palate are devoid of taste. The terminal organs of taste consist of peculiar bodies named taste-bulbs or taste-goblets, discovered by Schwalbe and Lovèn in 1867. They can be most easily demonstrated in the *papillæ foliatæ*, large oval prominences found on each side near the base of the tongue in the rabbit. Each papilla consists of a series of laminæ or folds, in the sides of which the taste-bodies are readily displayed in a transverse section. Taste-bodies are also found on the lateral aspects of the circumvallate papillæ, in the fungiform papillæ, in the papillæ of the soft palate and uvula, the under surface of the epiglottis, the upper part of the posterior surface of the epiglottis, the inner sides of the arytenoid cartilages, and even in the vocal chords.

The taste-bulbs are minute oval bodies, somewhat like an old-fashioned Florence flask, about $\frac{1}{300}$ inch in length by $\frac{1}{800}$ in breadth. Each consists of two sets of cells—an *outer* set, nucleated, fusiform, bent like the staves of a barrel, and arranged side by side so as to leave a small opening at the apex (the mouth of the barrel), called the gustatory pore; and an *inner* set, five to ten in number, lying in the center, pointed at the end next the gustatory pore, and branched at the other extremity. The branched ends are continuous with non-medullated nerve-fibers from the gustatory nerve. These taste-bodies are found in immense numbers; as many as 1,760 have been counted on one circumvallate papilla in the ox. They are absent in reptiles and birds.

Taste is no doubt closely allied to smell; hence in invertebrates organs are found that may be referred to either of the senses (see Smell). Tastes have been variously classified. One of the most useful classifications is into sweet, bitter, acid, and saline tastes. To excite the sensation, substances must be soluble in the fluid of the mouth. Insoluble substances, when brought into contact with the tongue, give rise to feelings of touch or of temperature, but excite no taste. The specific mode of action of sapid substances is quite unknown. The extent of surface acted on increases the massiveness of the sensation, while the intensity is affected by the degree of concentration of the solution of the sapid substance.

Disease of the tongue causing unnatural dryness may interfere with taste. Substances circulating in the blood may give rise to subjective sensations of taste. Thus santonine, morphia, and biliary products (as in jaundice) usually cause a bitter sensation, while the sufferer from diabetes is distressed by a persistent sweetish taste. The insane frequently have subjective tastes, which are real to the patient, and frequently cause much distress. In such cases, the sensation is excited by changes in the taste-centers of the brain. Increase in the sense of taste is called *hypergeusia*, diminution of it *hypogeusia*, and its entire loss *ageusia*. Rare cases occur where there is a subjective taste not associated with insanity nor with the circulation of any known sweetish matters in the blood, possibly caused by irritation of the gustatory nerves or by changes in the nerve centers.

TATARS. See Tartars.

TATE, Nahum, English poet-laureate, was born in 1652 in Dublin, and was educated at Trinity College there. He afterward removed to London, and adopted literature as a profession, succeeding Shadwell as poet-laureate in 1692. He died within the precincts of the Mint, Southwark (whither he had taken refuge from his debtors), August 12, 1715.

TATIAN, one of the earliest Christian apologists, whose personality and work had an important influence on the history of the church during the period of the Antonines. He was by birth an Assyrian (according to

Zahn of Semitic descent), but received a Greek education, and, after acquiring a very extensive knowledge of Greek literature, began to travel about the Roman empire as a wandering teacher or "sophist." But his inquiring disposition and his earnest spirit remained unsatisfied alike with the religions and the philosophies he encountered, while the doings of men, their greed for amusement and pleasure, their vanity and treachery, disgusted him. In this temper, about 150 A.D., he reached Rome, where the Old Testament fell into his hands, and at the same time he came into closer relations with the Christians; their firm faith, chaste morals, fearless courage, and close fellowship deeply impressed him, and in the end the spectacle of their life and their monotheistic doctrine founded upon prophetic revelation completely conquered him. Henceforward the whole unchristian world, with all its philosophy and culture, presented itself to him as mere darkness and the deception of demons, but the "barbarian philosophy" (for so he called Christianity) as the wisdom of God. He became a convert, and soon afterward (152–153) wrote (most probably in Greece, where he stayed for some time) his *Oratio ad Græcos*, which gained him great repute among the Christians, and is still extant.

Tatian was the first apologist to undertake, on behalf of Christianity, a work of the class which afterward developed into the numerous "world-histories" written from the Christian point of view. Tatian's diction is often rough, harsh, and abrupt, his sentences involved and inelegant. He has the art, indeed, of expressing himself with uncommon freedom and independence, and can put things also in a very graphic way, but at the same time he is a careless stylist, or rather, as an apostate from the Greek view of things, he has tried to accentuate his breach with classical traditions by elaborate carelessness and deliberate eccentricity.

Toward the end of his life, or perhaps even between 152 and 172, Tatian went from Rome to Mesopotamia, and there—probably in Edessa—wrought a great deal. It is probable that he was in Rome about the year 172, but whether he died there or in his native country is not ascertained.

TATIUS, ACHILLES. See ROMANCE.

TATTOOING, a custom extensively prevalent among savage nations of marking the skin with figures of various kinds, by means of slight incisions or punctures and a coloring matter. Tattooing is almost universal in the South Sea Islands, except where Christianity and civilization have put an end to it. The tattooing of New Zealanders and other South Sea Islanders often covers the whole face, and sometimes almost the entire body. It is performed in youth and marks the transition from boyhood to manhood. The operation is accompanied with superstitious ceremonies, and is attended with considerable pain, which, of course, must be borne with manly indifference. It is done by means of an instrument of bone, toothed at the edge, which is applied to the skin and struck with a piece of wood, having first been dipped in a thick mixture made by rubbing down charcoal with a little water. The marks which result are permanent, and appear black on a brown skin and blue on the skin of a white person. Tattooing has been practiced in nearly all parts of the world. The Bedouin Arabs and other eastern tribes, and many tribes of American Indians practice it to the present day. It is also a favorite means of adornment among sailors.

TAUCHNITZ, KARL CHRISTOPH TRAUG, a famous German printer and bookseller, was born at Grosspardau, near Leipsic, in 1761. In 1769 he began a small printing business of his own in Leipsic, with which he shortly afterward conjoined publishing and typefounding, and which in time became one of the greatest establishments of the kind in Germany. In 1809 he began to issue a series of editions of the classic authors, the elegance and cheapness of which gave them European circulation. He was the first to introduce stereotyping into Germany, and he also applied it to music, which had not been attempted before. On his death in 1836 the business was continued by his son. A nephew of the elder Tauchnitz, Christian Berlin Tauchnitz, also set up a publishing establishment in Leipsic, combined with printing. Among the most noted of his undertakings is the well known issue of the "British Authors," of which upward of 2,000 volumes have appeared. He was ennobled in 1860.

TAULER, JOHN, a remarkable mystic and preacher, was born at Strasburg, Germany, in 1290, and died there June 16, 1361.

TAUNTON, a municipal borough and market-town of Somerset, England, is situated in the beautiful and fertile vale of Taunton Dene, on the river Tone, on the Taunton and Bridgewater canal, and on several branches of the Great Western railway, 45 miles south-southwest of Bristol, 31 northeast of Exeter and 163 west-southwest of London. The population of the municipal and parliamentary borough (area 1,249 acres) in 1881 was 16,614.

TAUNTON, the capital of Bristol county, Mass., was settled in 1639, incorporated as a city in 1864, and is one of the best-known manufacturing points in the State. It is situated on Taunton river, thirty-five miles south of Boston, seventeen miles northeast of Providence, and fifteen north-northeast of Fall River. The city is also located on the Old Colony railroad, and its municipal jurisdiction includes the villages of Weir, Myricksville, and East Taunton, all of which are within a limited radius of "Taunton Green," the name given to a park in the most central portion of Taunton proper. The city is regularly laid out and embraces a large number of handsome residences, in the midst of surroundings equally handsome. Among its more prominent edifices are the Mason Locomotive Works, giving employment to a force of more than 1,000 men; the buildings, shops, etc., of the Taunton Copper Company, occupying an area of from ten to fifteen acres in extent; the extensive buildings connected with the State insane asylum, the Congregational, Unitarian, Episcopal, Baptist, and Catholic church edifices, with some others, are specially noted for their architectural superiority. The city also contains a court-house and municipal buildings, three national and two savings banks, one daily and two weekly papers and a large and varied line of manufactures. In addition to those mentioned there are saw, grist, planing and paint mills; britannia ware, button, tack, blueing, shuttle, boot and shoe, pump, printing press, and soap factories; cotton mills, including among their products cotton batting, yarns, flannels, print-cloths, denims and tickings; manufactories of stove and hardware specialties, agricultural implements, silver plated ware, carriages, furnaces, paper, coffin-trimmings and common, sewer, pressed and fire brick, the combined output of the four latter commodities annually aggregating from ten to twenty millions of brick. The schools are made up of a high school and intermediate departments, also the Bristol academy and a number of private institutions. The city is provided with a free library containing 15,000 volumes, several large hotels, public halls, and other conveniences. It is lighted by gas and contains a population (United States census of 1890) of 25,448.

TAURIDA, a government of Southern Russia, includes the peninsula of CRIMEA and a tract of mainland situated between the lower Dnieper and the coasts of the Black Sea and the Sea of Azoff, and is bounded by these two seas on the south, while it has on the north the governments of Kherson and Ekaterinoslaff. The area is 24,540 square miles, of which 6,990 square miles belong to the Crimea. The population in 1883 was 940,530 (247,780 in Crimea). The continental portion, although less mixed than that of the peninsula, consists of Russians (Great, Little, and White Russians), who constitute 83 per cent. of the population, Germans 11 per cent., Bulgarians 5 per cent., and Jews 1 per cent.

TAUROMENIUM. See TAORMINA.

TAURUS. See ASIA MINOR.

TAUTOLOGY is a term used to denote the useless repetition of the same ideas in different words. It is considered one of the worst vices, whether of oral or written style, and certainly none more effectually robs language of its force and impressiveness.

TAVERN, a place of entertainment for man and beast. It is not a legal term and is used synonymously with INN and PUBLIC HOUSE.

TAVERNIER, JEAN BAPTISTE (Baron d'Aubonne), a celebrated French traveler, was born in Paris in 1605. He made a tour of Europe and Asia, which lasted from December, 1630, to 1633. The second tour, which lasted from 1638 to 1643, included all the known portions of Asia, which he revisited on four other occasions. He was one of the most remarkable of travelers, wholly devoid of classic sentiment. His statements are distinguished by the accurate truthfulness not common among travelers. His travels were originally published in three volumes from 1676 to 1679. He died in Moscow, July, 1689.

TAVIRA, a seaport of Portugal, in the province of Algarves, at the mouth of the Seca, twenty-one miles east-northeast of Faro. It is regularly built, and has an alcazar, used as an official residence, besides other public buildings. It has sardine and tunny fisheries, and carries on a considerable coasting trade. Excellent fruit is grown in the neighborhood. The population in 1888 was 11,459.

TAVISTOCK, a town of Devonshire, England, is finely situated in the valley of the Tavy, on the western border of Dartmoor, and on the South Devon railway, 15 miles north of Plymouth, 14 southeast of Launceston, and 213 west-southwest of London. The population of the township in 1881 was 6,914. The parliamentary borough (area 11,450 acres), which had a population in 1871 of 7,725 and in 1881 of 6,879, was merged in the county in 1885.

TAVOY, a British district in the Tenasserim division of Burmah, lying between 13° 15′ and 15° 11′ N. latitude and between 97° 48′ and 98° 44′ E. longitude. It has an area of 7,200 square miles, and is bounded on the north by Amherst district, east by the Yoma Mountains, south by Mergui district, and west by the Bay of Bengal.

The census of 1881 returned the population of Tavoy at 84,988 (males 41,785, females 43,203), of whom 82,187 were Buddhists, 828 were Mohammedans, and 1,368 were Christians. The headquarters and capital is Tavoy town, which is situated on the left bank of the river of the same name, and contained a population of 13,372 in 1881. Of the total area, only 83,740 acres are cultivated. Rice is the principal product; the betelnut is extensively grown for home consumption; and the district is particularly rich in fruit trees. With its only port difficult of access, and with no means of internal communication, the trade of Tavoy district has always been small and almost entirely confined to Siam and the Straits Settlements. The principal imports are piece goods and other cotton manufactures, raw silk, tea, crockery, wines and spirits, metals, and provisions. The chief manufactures are salt and earthen pots.

TAWING. See LEATHER.

TAXATION. With regard to taxes in general Adam Smith lays down four maxims which have been briefly described as the maxims of *equality*, *certainty*, *convenience*, and *economy*. The treatment of the general principles of taxation by subsequent writers consists in the main of the development and criticism of these celebrated canons.

Equality of Taxation.—The subjoined passage from Adam Smith contains the germs of several distinct theories of what constitutes just or equal taxation:—

"The subjects of every State ought to contribute toward the support of its government as nearly as possible in proportion to their respective abilities, that is, in proportion to the revenue which they respectively enjoy under the protection of the State. The expense of government to the individuals of a great nation is like the expense of management to the joint tenants of a great estate, who are all obliged to contribute in proportion to their respective interests in the estate. In the observation or neglect of this maxim consists what is called the equality or inequality of taxation. Every tax, it must be observed once for all, which falls finally upon one only of the three sorts of revenue above mentioned [viz., rent, wages, profits] is necessarily unequal in so far as it does not affect the other two. In the following examination of different taxes I shall seldom take much further notice of this sort of inequality, but shall in most cases confine my observations to that inequality which is occasioned by a particular tax falling unequally upon that particular sort of private revenue which is affected by it."

The first sentence implies (*a*) that every government has the *right* to exact contributions for its support from all its subjects. According to this view, the right of taxation is derived directly from the conception of sovereignty. It was the determination to insist on this principle which led to the retention of the 3d. per pound duty on tea, that "figment of a tax, that peppercorn rent," which lost the British their American colonies. The Americans opposed to this absolute doctrine the maxim that taxation ought to be coincident with *representation*—that only those who shared in the powers should have the burdens of government. If the latter opinion is strictly construed, it would follow that all taxes on articles of universal consumption are unjust except in a country where all who have the natural have also the legal capacity of voting. The doctrine of sovereignty as the basis of taxation, pushed to its logical extreme, results in the maxim that a government should impose such taxes as are "most easily assessed and collected, and are at the same time most conducive to the public interests" (M'Culloch).

Accordingly, a second basis of taxation (*b*) is found in the expansion of the term "abilities" used by Adam Smith, which leads to the position that taxes ought to be levied so as to involve *equality of sacrifice* on the part of the contributors. This is the ideal of taxation which was advocated by Mill and Fawcett. "Equality of taxation as a maxim of politics," says the former, "means equality of sacrifice. It means the apportioning the contribution of each person towards the expenses of government, so that he shall feel neither more nor less inconvenience from his share of the payment than every other person experiences from his." It is admitted that this standard cannot be completely realized, but it is thought to furnish a proper foundation of remission in some cases and of proportional increase of taxation in others. It is generally on this ground that it is proposed to leave incomes below a certain amount untaxed.

A third basis of taxation, however, is found in the principle (*c*) that taxes ought to be considered as *payment for valuable services* rendered by the State to individuals, and this seems to be the position Adam Smith had in view in introducing the clause "under the protection of the State," and in comparing the individuals of a great nation to the joint tenants of a great estate. It is easy to show, as Mill does, that, if protection is taken in its narrowest signification, as a matter of fact the poor need more protection than the rich, but the argument becomes more plausible, and more consonant with the general teaching of Mill, if stress is laid on the protection and assistance afforded by the State in the process of acquisition of individual fortunes – a view of taxation sometimes called the *social dividend theory* (*cf.* Walker, Helferich). It is really on this ground that Mill, followed by others, proposes that the "unearned increment" from land should be taken by the State, and, as has often been pointed out, "unearned increments" are by no means confined to land.

The object of taxation is in general to provide the State with an adequate revenue, but in all cases the indirect effects are important, and sometimes provision of revenue is considered of secondary importance. Accordingly it has been maintained (*d*) that the State ought to use its powers of taxation for the promotion of various *social ends*. Adam Smith remarks that "it has for some time past been the policy of Great Britain to discourage the consumption of spirituous liquors, on account of their supposed tendency to ruin the health and corrupt the morals of the common people," and in our own times the falling off in the revenue from alcoholic drinks often furnishes a subject for apparent congratulation in "budget" speeches. German writers with socialistic tendencies (*e.g.*, Wagner) have emphasized this social point of taxation; and Mill, although disapproving of graduated taxation of income, advocated the imposition of extremely heavy succession duties, with the object of promoting a better distribution of national wealth and compelling individuals to rely on themselves. Many nations again have imposed duties on imports with the view of protecting and encouraging home industries, and most of the import duties levied in England before the great reforms of Peel were of this nature. Accordingly, both theoretically and practically, the promotion of social or moral ends may be considered as a fourth basis of taxation. It is worth noticing that in early times the fines received in the courts of justice were an important source of revenue.

Whatever basis of taxation be adopted, the elementary principle of justice noticed in the conclusion of A. Smith's first canon must be considered. If it is just to tax A, it is just to tax B under precisely similar circumstances. Thus stated, the principle seems almost formal, but for practical purposes small differences in circumstances may be neglected, and it is clear that in any great nation the taxpayers may be arranged in a limited number of groups, within each of which the constituent individuals may be regarded as similarly situated. A tax on rent, or wages, or profits would be obviously unequal if those in one place or employment were taxed while those in another were left free. The practical difficulty is to discover what cases may fairly be regarded as similar, especially if equality of sacrifice be taken as the ideal.

As a matter of fact, in every civilized community a complex system of taxation is adopted, the different parts of which rest in different degrees upon the various principles just noticed. Some taxes are justified on the grounds of their convenience to the sovereign power, and others are increased or diminished in certain cases in accordance with the principle of equality of sacrifice; some are regarded as payments for services rendered by the State, others partake of the nature of sumptuary regulations or are approved on various social or moral grounds; and sometimes the imposition of one productive tax involves, on the ground of simple equality, the adoption of similar taxes which are hardly worth collecting.

The remaining canons of Adam Smith are partly, like the first, ethical in character, partly purely economic. Of the second—the canon of *certainty*—Adam Smith remarks:—"The time of payment, the manner of payment, the quantity to be paid, ought all to be clear and plain to the contributor and to every other person [on the ground of the otherwise arbitrary powers which are given to the tax-gatherer] * * * The certainty of what each individual ought to pay is in taxation a matter of so great importance that a very considerable degree of inequality, it appears, I believe, from the experience of all nations, is not near so great an evil as a very small degree of uncertainty." Perhaps the best example of the infringement of this canon is furnished by the taxes levied from the miserable provincials by their Roman governors.

The third rule—the canon of *convenience*—which enjoins that "every tax ought to be levied at the time or in the manner to which it is most likely to be convenient for the contributor to pay it," may be justified, not merely on general grounds of good government, but also on the special economic ground of the increase in the productiveness of taxes which satisfy the condition. It has been found possible to raise a considerable revenue by taxes on commodities, the payments of which by the consumers are made in insensible portions, when it would have been impossible to collect the same amount by direct taxation at comparatively long intervals. Taxation is in this respect like bleeding.

The fourth rule—the canon of *economy*—states as its general principle that "every tax ought to be so contrived as both to take out and to keep out of the pockets of the people as little as possible over and above what it brings into the public treasury of the State." Taxes may, according to Adam Smith, break this rule by requiring a large number of officials for their collection, by restraint of trade and production, by encouraging smuggling, and by causing unnecessary vexation; "and, though vexation is not, strictly speaking, expense, it is certainly equivalent to the expense at which every man would be willing to redeem himself from it." On smuggling Adam Smith elsewhere remarks that "to pretend to have any scruple about buying smuggled goods would in most countries be regarded as one of those pedantic pieces of hypocrisy which serve only to expose the person who affects to practice them to the suspicion of being a greater knave than his neighbors." It may be observed that in practical politics it is generally taken for granted that a tax which can be evaded will be evaded, and indirect methods of taxation are to a great extent devices by which possibilities of evasion are restricted.

To these general rules of taxation explicitly given by Adam Smith, the following may be added, most of which are implied in different passages of his treatment of taxation, but have been expounded and emphasized by subsequent writers. A convenient summary is given by Helferich in Schönberg's *Handbuch der Politischen Oekonomie.* (*a*) A given amount of revenue is, as a rule, both from the point of view of the government and its subjects, more conveniently raised from a small number of very productive taxes than from a larger number with smaller returns per unit. This was one of the principal financial reforms advocated by Adam Smith with reference to the customs duties. (*b*) A good system of taxation ought to provide for a self-acting increase in the revenue in proportion as the population and the consequent demands for governmental expenditure increase. It has been found by experience that an old tax causes less inconvenience than a new tax of smaller amount, a fact which is so striking in some cases as to have given rise to the saying that an old tax is no tax. (*c*) Those taxes are best which yield a steady and calculable return, instead of a return fluctuating in character and difficult to estimate. (*d*) Those taxes are best which in case of need can be most conveniently increased in amount. It is this characteristic of the income tax which renders it so popular with chancellors of the exchequer. (*e*) Regard must always be paid to the real incidence of taxation, and care taken that the real burden of the tax falls on those aimed at by the legislature. No part of the theory or practice of taxation has given rise to so much controversy as the incidence of particular taxes, a subject indeed of so much difficulty and importance as to occupy the greater portion of the treatment by systematic writers.

INCIDENCE OF TAXATION.—Taxes are generally divided into *direct* and *indirect*. A direct tax is defined by Mill as one "demanded from the very persons who it is intended or desired should pay it." Others (*e.g.*, M'Culloch) define it as a tax taken directly from income or capital. In the former definition non-transferable taxes on expenditure would be included (*e.g.*, a tax on livery servants), but not in the latter. Mill's definition has been generally adopted (*e.g.*, by Wagner, in the German *Handbuch*, vol. ii. p. 152); but in any case the most important direct taxes practically are those levied on income or capital directly, and the most important indirect the customs and excise duties.

Taxes on Rent.—What is commonly known as rent consists in general of two parts, which may be termed economic rent and profit rent. Economic rent arises from the superiority of advantage of any source in the production of a certain amount of utility over the least productive source which the conditions of demand and supply (including transmission to market) render it possible to employ. Thus, in the production of food, some lands have an advantage in fertility or situation; again, in furnishing amenities of accommodation or facilities for business, some houses have from their situation a similar advantage; and again, different processes in the arts and manufactures are superior to others (giving rise to patents). In all these cases where the amount of the superior sources is limited (naturally or artificially), and recourse must be made to inferior sources of supply, economic rent is paid for the superior advantage. Any tax imposed on this species of revenue falls on the owner. If levied in the first instance from the lessee, he will pay so much less rent, and any new taxes imposed during the currency of leases ought, if intended to fall on the owner, to be taken directly from him.

Taxes on Profits.—Profits, as commonly used, is a term embracing three elements which, from an economic and financial point of view, are quite distinct in character, viz., interest (pure and simple), insurance against risk, and earnings of management. The interest on capital in any industrial area, lent on the same security, tends to equality. If, then, a tax is imposed on *interest in every form*, the incidence in the first place will be on the owners of capital. But two indirect consequences will follow. (1) As Adam Smith remarks, "the proprietor of stock is properly a citizen of the world, and is not necessarily attached to any particular country He would be apt to abandon the country in which he was exposed to a vexatious inquisition in order to be assessed to a burdensome tax, and would remove his stock to some other country, where he could either carry on his business or enjoy his fortune more at his ease." In this case the ultimate result would be that the country in which the tax was imposed would possess less capital, and thus would yield a higher rate of interest sufficient to counterbalance the burden of the tax. (2) The tax would tend to check the accumulation of capital within the country, so far as the interest received is a cause of accumulation, with the same ultimate result as in the former case. It must, however, be observed that the rate of interest is only one of the causes affecting the accumulation of capital.

Taxes on Capital.—A heavy tax on large capitals at home will place a premium on investments abroad, in which evasion would be easy. Perhaps, with the present rate of accumulation, the objection may be made light of, as it is by Mill; but the second, if less obvious, is more important. All our great staple manufactures are necessarily conducted on a large scale, and in many respects also large agricultural capitals are most productive. In manufactures, as a rule, the larger the scale of operations the more extended will be the division of labor in production, and the greater the facilities for ready sale in foreign markets. Of all the causes which contribute to our commercial prosperity, perhaps the most important is the large scale on which our operations are conducted. We are able to employ machinery where the foreigner, working on a smaller scale, is obliged to use manual labor. There can be little doubt that graduated taxation, even in the modified form proposed by Mill, would tend to check production on a large scale. Indirectly it might artificially foster joint-stock companies.

Taxes on Wages.—It is clear that the treatment of taxes on wages will depend on the general view taken of the determination of the rate of wages. Adam Smith appears to lay undue stress on the price of provisions, and to think that in most cases taxes on wages must fall on the employer of labor. There seems, however, to be no sufficient reason why tax on labor should be transferred to the employer, except in the case where the wages are really at a minimum below which the supply of efficient labor could not be kept up. Even in this case, as Professor Walker shows, there would probably be a degradation of labor before the rise in wages was effected. Certainly no practical statesman at the present time would venture to propose a direct tax on wages, under the idea that it would be transferred to the employer. In Germany it was found necessary to abandon the system, owing to the hardship inflicted on the poor. At any rate, in all cases in which the rate of wages is above the "necessary" minimum, a tax on wages must fall on the laborer. A differential tax on some particular species of employment would, unless it partook of the nature of a monopoly, tend to fall on the consumer of the article produced or the person who enjoys the service rendered. In every case, speaking generally, the incidence of the tax will depend on the conditions of the demand and supply of the labor in question, and no further analysis can be given without entering into the general principles governing wages. (See WAGES).

Taxes on Commodities.—The general principles applicable in this case are that, where production takes place under free competition, the tax will, owing to the tendency of profits to equality, be transferred to the consumer, but that, when the article is practically monopolized, a tax must fall on the monopolist, on the assumption that he has already fixed such a price for the article as will, considering the law of demand and the expenses of production, yield him a maximum revenue.

The incidence of export and import duties is peculiarly difficult to ascertain even theoretically. The prevailing opinion that an import duty necessarily falls on the consumer of the import necessarily involves as its counterpart the position that an export duty must fall on the consumer of the export. If the latter view is upheld it is curious that export duties find such little favor with practical statesmen. It is clear, however, that the real incidence of export and import duties will depend partly on the conditions of production in various countries, partly on the variations in demand due to changes in price, partly on the indirect influence on the general balance of trade, and partly on the possibility of using substitutes for the article taxed.

TAXIDERMY, the art of preserving the integument, together with the scales, feathers, or fur, of animals. Little is known of the beginnings of the practice of the "stuffing" or "setting up" of animals for ornament or for scientific purposes; and it is highly probable, from what we gather from old works of travel or natural history, that the art is not more than some three hundred years old. It was practiced in England toward the end of the seventeenth century, as is proved by the Sloane collection, which in 1725 formed the nucleus of the collection of natural history now lodged in the galleries at South Kensington.

The preparation and mounting of bird specimens, the objects most usually selected by the amateur, are performed in the following manner. The specimen to be operated upon should have its nostrils and throat closed by plugs of cotton wool or tow; both wing-bones should be broken close to the body, and the bird laid upon a table on its back; and, as birds—especially white-breasted ones—should seldom, if ever, be opened on the breast, an incision should be made in the skin under the wing on the side most damaged, from which the thigh protrudes when pushed up slightly; this is cut through at its junction with the body, when the knife is gently used to separate the skin from this, until the wing-bone is seen on the open side. This is then cut through by scissors, and by careful manipulation the skin is further freed from the back and breast until the neck can be cut off. The other side now remains to be dealt with; from this the wing is cut by traveling downward; the remaining leg is cut away, and very careful skinning over the stomach and upon the lower back brings the operator to the tail, which is cut off, leaving a small portion of the bone (the coccyx) in the skin. The body now falls off, and nothing remains in the skin but the neck and head. To skin these out properly without unduly stretching the integument, is a task trying to the patience, but it can be accomplished by gradually working the skin away from the back of the head forward, taking care to avoid cutting the eyes or the eyelids, but, by cautious management, to cut the membranous skin over those parts, so that the eyes are easily extracted from the orbits without bursting. The skin should be freed down nearly to the beak, and then the back of the head, with neck attached, should be cut off, the brains extracted, all the flesh cleared from the skull and from the bones of the wings, legs, and tail, the skin painted with the preservative, and ultimately turned into its proper position. When "skins" only are to be made for the cabinet, it is sufficient to fill the head and neck with chopped tow, the body with a false one made of tow, lightly packed or loose according to the genius of the preparer, to sew up the skin of the stomach, and to place a band of paper lightly pinned around the body over the breast and wings, and allow it to remain in a warm position, free from dust, for several days or weeks, according to the size of the specimen. It should then be labeled with name, sex, locality, and date, and put away with insect powder around it.

When, however, the specimen is to be "mounted," the operations should be carried up to the point of returning the skin, and then a false body of tightly wrapped tow is made upon a wire pointed at its upper end. This is inserted through the incision under the wing, the pointed end going up the neck and through the skull to the outside. When the imitation body rests within the skin, pointed wires are thrust through the soles of the feet, up the skin of the back of the legs, and are finally clinched in the body. Wires are also thrust into the butts of the wings, following the skin of the under surface, and also clinched through into the body. A stand or perch is provided, and the bird, being fixed upon this, is, after the eyes have been inserted, arranged in the most natural attitude which the skill of the taxidermist can give it.

Mammals are cut along the stomach from nearly the middle to the breast, and are skinned by working out the hind legs first, cutting them off under the skin at the junction of the femur with the tibia, and carefully stripping the skin off the lower back and front until the tail is reached, the flesh and bones of which are pulled out of the skin, leaving the operator free to follow on up the back and chest until the fore legs are reached, which are cut off in like manner. The neck and head are skinned out down to the inner edges of the lips and nose, great care being exercised not to cut the outer portions of the ears, the eyelids, the nose, or the lips. The flesh being cleared off, and the brain and eyes extracted, the skull should adhere to the skin by the inner edges of the lips. All the flesh should be trimmed from the bones of the legs. The head, being shaped, where the flesh was removed, by tow and clay, is returned into the skin. A long wire of sufficient strength is tightly bound with tow, making a long, narrow body, through which wires are thrust by the skin of the soles of the feet. The leg wires and bones being wrapped with tow and clay into shape, the points of the wires are pushed through the tow body and clinched. They and the body are then bent into the desired position, and modeled up by the addition of more tow and clay, until the contours of the natural body are imitated, when the stomach is sewn up. A board is provided upon which to fix the specimen, artificial eyes are inserted, the lips, nose, and eyelids fixed by means of pins or "needle-points," and the specimen is then placed in a warm situation to dry.

Reptiles, when small, have their skin removed by cutting away the attachment of the skull to the cervical vertebræ, and by turning the decapitated trunk out at the mouth by delicate manipulation. When large, they are cut along their median line, and treated in the same manner as mammals.

Fishes, after being covered on their best side with paper or muslin to protect the scales, are cut along the other side from the tail to the gills, and are skinned out by removing "cutlets," as large as is possible without cracking the skin, which, indeed, should be kept damp during work. After being cured with a preservative, they are filled with sawdust or dry plaster of Paris, sewn up, turned over on a board, the fins pinned out, and the mouth adjusted, and, when perfectly dry, the plaster may be shaken out.

TAXILA. See RAWAL PINDI.

TAY, the longest river in Scotland, has its source on the northern side of Ben Lui, on the borders of Argyllshire and Perthshire, being known in its earlier course as the Fillan, and, after forming Loch Dochart, as the Dochart, until entering Loch Tay, twenty-five miles from its source, at an elevation above sea-level of 553 feet.

TAYLOR, BAYARD, one of the most prolific among American authors, was born at Kennett Square, in Chester county, Penn., on January 25, 1825. The son of a well-to-do farmer, he received his early instruction in an academy at West Chester, and, later, at Unionville. At the age of seventeen he was apprenticed to a printer in West Chester. A little volume published in 1844 under the title *Ximena, or the Battle of the Sierra Morena, and other Poems*, brought its author a little cash, and indirectly it did him better service as the means of his introduction to *The New York Tribune*. With the money thus obtained, and with an advance made to him on account of some journalistic work to be done in Europe, "J. B. Taylor" (as he had up to that time signed himself, though he bore no other Christian name than Bayard) set sail for the East. The young poet spent a happy time in roaming through certain districts of England, France, Germany, and Italy; that he was a born traveler is evident from the fact that this pedestrian tour of almost two years cost him only $500. The graphic accounts which he sent from Europe to *The New York Tribune*, *The Saturday Evening Post*, and *The United States Gazette* were so highly appreciated that on Taylor's return to America he was advised to throw his articles into book form. In 1846, accordingly, appeared his *Views Afoot, or Europe seen with Knapsack and Staff*. This pleasant book had considerable popularity, and its author now found himself a recognized man of letters; moreover, Horace Greeley, then editor of the *Tribune*, placed Taylor on the staff of that journal, thus securing him a certain if a moderate income. His next journey, made when the gold-fever was at its height, was to California, as correspondent for the *Tribune;* from this expedition he returned by way of Mexico, and, seeing his opportunity, published (1850) a highly successful book of travels, entitled *Eldorado, or Adventures in the Path of Empire*. Ten thousand copies were said to have been sold in America. and 30,000 in Great Britain, within a fortnight from the date of issue. Bayard Taylor always considered himself native to the East, and it was with great delight that in 1851 he found himself on the banks of the Nile. He ascended as far as 12° 30′ N. latitude, and stored his memory with countless sights and delights, to many of which he afterward gave expression in metrical form. From England, toward the end of 1852, he sailed for Calcutta, proceeding thence to China, where he joined the expedition of Commodore Perry to Japan. The results of these journeys (besides his poetical memorials, to which reference will be afterward made) were *A Journey to Central Africa, or Life and Landscapes from Egypt to the Negro Kingdoms of the Nile* (1854); *The Land of the Saracens, or Pictures of Palestine, Asia Minor, Sicily, and Spain* (1854); and *A Visit to India, China, and Japan in the Year 1853* (1855). On his return (1854) from these various journeyings he entered, with marked success, upon the career of a public lecturer, delivering addresses in every town of importance from Maine to Wisconsin. After two years' experience of this lucrative profession, he again started on his travels, on this occasion for northern Europe, his special object being the study of Swedish life, language, and literature. The most noteworthy result was the long narrative poem *Lars*, but his "Swedish Letters" to the *Tribune* were also republished, under the title *Northern Travel* (1857). In October, 1857, he married Maria Hansen, the daughter of the well-known German astronomer. The ensuing winter was spent in Greece. In 1859 Taylor once more traversed the whole extent of the western American gold region, the primary cause of the journey lying in an invitation to lecture at San Francisco. About three years later he entered the diplomatic service as secretary of legation at St. Petersburg, and the following year (1863) became chargé d'affaires at the Russian capital. In 1864 he returned to the United States and resumed his active literary labors, and it was at this period that *Hannah Thurston*, the first of his four novels, was published. This book had a moderate success, but neither in it nor in its successors did Bayard Taylor betray any special talent as a novelist: some of his characters are faithful studies from life, and he could describe well the aspects of nature—but a good deal more than this is necessary for the creation of noteworthy romances. In 1874 he went to Iceland, to take part in the centennial celebration which was held in that year. In June, 1878, he was accredited United States minister at Berlin. Notwithstanding the resistless passion for travel, which had always possessed him, Bayard Taylor was (when not actually *en route*) sedentary in his habits, especially in the later years of his life; and at Berlin he aggravated a constitutional liver affection by too sedulous devotion to literary studies and pursuits, in the intervals of leisure from his diplomatic duties. His death occurred on December 17th, only a few months after his arrival in Berlin.

TAYLOR, BROOK, a distinguished mathematician of Newton's school, was the son of John Taylor, of Bifrons House, Kent, by Olivia, daughter of Sir Nicholas Tempest, Bart., of Durham, and was born at Edmonton in Middlesex, England, August 18th, 1685. He died in 1731.

TAYLOR, SIR HENRY, poet and colonial statesman, was born October 18th, 1800, at Bishop-Middleham, in the county of Durham. In October, 1822, an article from his pen on Moore's *Irish Melodies* appeared in the *Quarterly Review*. A year later he departed for London to seek his fortune as a man of letters, and met with such rapid success, though not precisely in this capacity, as has but rarely attended an unknown young man. He became editor of the *London Magazine*, to which he had already contributed, and in January, 1824, obtained, through the influence of Sir Henry Holland, an appointment in the Colonial Office, insuring him not only an ample salary, but considerable influence in this department of public affairs. The general standard of the office was probably at that time low; at all events Taylor was immediately intrusted with the preparation of confidential state papers, and his opinion soon exercised an important influence on the decisions of the secretary of state.

He actively promoted the emancipation of the slaves in 1833, and became an intimate ally of Sir James Stephen, then counsel to the colonial office, afterwards under-secretary, by whom the act of emancipation was principally framed. His first drama, *Isaac Commenus*, was published anonymously in 1827. Though highly praised by Southey, it made little impression on the public. *Philip van Artevelde*, the subject of which had been recommended to him by Southey, was begun in 1828, published in 1834, and, aided by a laudatory criticism from Lockhart's pen, achieved extraordinary success. *Edwin the Fair* (1842) was less warmly received. In the interim he had married (1839) the daughter of his former chief, Lord Monteagle, and, in conjunction with Stephen, had taken a leading part in the abolition of negro apprenticeship in the West Indies. *The Statesman*, a volume of essays suggested by his official position, had been published in 1836, and about the same time he had written in the *Quarterly* the friendly advertisements of Wordsworth and Southey, subsequently published under the somewhat misleading title of *Notes from Books*. In 1847 he was offered the under-secretaryship of state, which he declined. *Notes from Life* and *The Eve of the Conquest* appeared in this year, and *Notes from Books* in 1849. An experiment in romantic comedy, *The Virgin Widow*, afterward entitled *A Sicilian Summer*, was published in 1850. "The pleasantest play I had written," says the author; "and I never could tell why people would not be pleased with it." His last dramatic work was *St. Clement's Eve*, published in 1862. In 1869 he was made K.C.M.G. He retired from the colonial office in 1872, though continuing to be consulted by government. His last days were spent at Bournemouth in the enjoyment of universal respect; and the public, to whom he had hitherto been an almost impersonal existence, became familiarized with the extreme picturesqueness of his appearance in old age, as represented in the photographs of his friend Mrs. Cameron. He died on March 27, 1886.

TAYLOR, ISAAC, a voluminous writer on philosophical and theological subjects, was born at Lavenham, Suffolk, in 1787, and was trained by his father to be an artist, but early adopted literature as a profession. From 1824, the year of his marriage, he lived a busy but uneventful life at Ongar, in the parish of Stanford Rivers, Essex, where he died on June 28, 1865.

TAYLOR, JEREMY, was a native of Cambridge, England, and was baptized on August 15, 1613. Jeremy, after passing through the grammar school, was entered at Caius College as a sizar in 1626. He was elected a fellow of his college in 1633. After two years in Oxford, in March, 1638, he was presented by Juxon, bishop of London, to the rectory of Uppingham, in Rutlandshire. Serious consequences followed his attachment to the Royalist cause, when, in 1642, the livings of the loyal clergy were sequestered by decree of parliament.

In 1647 appeared his most important work, *The Liberty of Prophesying*, and in the following year the complete edition of his *Apology for Authorized and Set Forms of Liturgy Against the Pretense of the Spirit*, as well as his *Life of Christ, or the Great Exemplar*, a book which at once won a popularity it still in large measure retains. Then followed in rapid succession the *Twenty-seven Sermons*, "for the summer half-year," and the *Twenty-five* "for the winter half-year," *Holy Living, Holy Dying*, a controversial treatise on the Real Presence, the *Golden Grove*, and the *Unum Necessarium*, which by its Pelagianism gave great offense. During these years he was also busy with his *Doctor Dubitantium* (published in 1660).

At the Restoration, instead of being recalled to England, as he probably expected and certainly desired, he was appointed to the see of Down and Connor, to which was shortly added the small and adjacent diocese of Dromore. He was also made a member of the Irish privy council and vice-chancellor of the university of Dublin. After a ten days' illness, he died at Lisburn on August 13, 1667, in the fifty-fifth year of his life and the seventh of his episcopate.

TAYLOR, JOHN, commonly called "The Water Poet," was born at Gloucester, England, in August, 1580. Of his parentage and early boyhood very little is known, and that little is mainly to be gleaned from various scattered personal allusions in the numerous short writings of this prolific wit and rhymster. His "works," sixty-three in number, first appeared in one large volume—now a rarity sought after by collectors—in 1630. At the outbreak of the Civil War Taylor retired to Oxford. He died in 1654.

TAYLOR, TOM, dramatist and art critic, was born at Sunderland, England, in 1817. In his very early years Tom Taylor showed a predilection for the drama, and was in the habit of performing dramatic pieces along with a number of children in a loft over a brewer's stable. His first dramatic composition was a rhymed fairy tale or extravaganza, written in conjunction with Albert Smith and Charles Kenny, and performed in 1846. From this time he wrote for the stage continuously till the close of his life, his dramatic compositions or adaptations numbering in all over 100, among the best known of which are *Still Water Runs Deep*, *Victims*, the *Contested Election*, the *Overland Route*, the *Ticket of Leave Man*, *Anne Boleyn*, and *Joan of Arc*. He may perhaps be regarded as the first dramatist of his time. In 1872 he withdrew from public life, and, on the death of Shirley Brooks in 1873, he became editor of *Punch*. He had some talent for painting, and for many years was art critic to the *Times*. He died at Lavender Sweep, Wandsworth, July 12, 1880.

TAYLOR, ZACHARY, twelfth president of the United States, was born in Orange county, Va., November 24, 1784, and died at Washington, D.C., July 9, 1850. He was the son of Colonel Richard Taylor, an officer in the Revolutionary war, and one of the first settlers in Louisville, Ky. Taylor received practically no education, and it was not until his twenty-fourth year that he obtained an appointment as lieutenant in the United States army. Two years later he was promoted to a captaincy and assigned to duty on the frontier. In 1812, with a force of less than fifty men, he defended Fort Harrison, on the Wabash river, against a large force of Indians, led by Tecumseh. He was promoted major; and in 1832 served in the Black Hawk war with the rank of colonel. In 1836 he took part in the Seminole war and gained a great victory over the Indians in Florida. As a reward he was appointed to the command of the entire United States forces and commissioned brigadier-general. In 1840 he purchased a cotton plantation at Baton Rouge, La. In March, 1845, the United States congress passed a resolution for the annexation of Texas, then an independent republic. Texas claimed as its western boundary the Rio Grande river; the Mexicans insisted that the territory under dispute belonged to them and organized an army to reconquer the same. Taylor was ordered with a force of 4,000 men to occupy the town of Corpus Christi and to watch the frontier. In March, 1846, he moved his troops across the disputed territory and constructed a fort, which he named Fort Brown, opposite to the Mexican town of Matamoros. The Mexican commander, General AMPUDIA (*q.v.*), demanded that Taylor should withdraw his troops pending negotiations. This was refused and General Arista, second in command under Ampudia, crossed the Rio Grande with 6,000 men. On May 8, 1846, General Taylor met Arista at Palo Alto, and defeated him with great loss, and after this fight Arista was again defeated at Resaca and driven across the Rio Grande. There had been much opposition, especially in New England, to anything which looked like an aggressive war against Mexico, but the president (Polk) sent a message to congress, stating that war existed by the act of Mexico, and calling for 50,000 volunteers to invade that country. Taylor was made major-general of the army and instructed to make direct for the capital of Mexico. On September 9, 1846, with 6,000 men, he attacked the city of Monterey, which was defended by about 10,000 Mexican troops, and after a siege of ten days and three days of hard fighting the city was surrendered. At this point General Winfield Scott, commander-in-chief of the United States army, withdrew a large portion of Taylor's troops, leaving him with not more than 5,000 men under his command. Santa Anna, the president of Mexico, advanced against Taylor with an army of over 20,000 men. The forces met at Buena Vista, where, after a desperate struggle, Taylor succeeded in completely annihilating the enemy.

Although the war was decidedly unpopular, excepting in the South, it secured the nomination for the presidency for the victorious general. Such men as Clay, Webster, and even General Scott himself, were passed over, and General Taylor, whose popular name was "Rough and Ready," who was a slave holder, who was ignorant to the last degree, and who had not voted for forty years, received the nomination and was triumphantly elected, defeating Cass, the Democrat, and Martin Van Buren, the "Free Soil" candidate. On his accession to office, March, 1849, President Taylor found a Democratic majority in congress, and a dozen important questions, such as the admission of the new State of California, the settlement of the boundaries of Texas, and the organization of the new territory acquired from Mexico, confronting him. The turmoil of politics was too much for the old soldier, and on July 4, 1850, sixteen months after his inauguration as president, Taylor was stricken down with an illness which terminated his life five days later. He was succeeded in the presidency by Millard Fillmore.

TAYLOR, Rev. Isaac, M.A., vicar of Holy Trinity, Twickenham, England, was born at Stanford Rivers, England, March 3, 1829. He is the author of *The Liturgy and the Dissenters*, and one or two other theological pamphlets. His works on philology have won him a national reputation. His *Words and Places, or Etymological Illustrations of History, Ethnology and Geography*, which was published in 1865, is a work of great research. He also, in 1874, published *Etruscan Researches*, which received a severe handling from critics, especially Prof. Max Müller. In 1876 he published *The Etruscan Language*.

TCHAD, Tsad, or Chad, Lake. See Africa and Soudan.

TCHEREMISSES, or Cheremisses. See Finland and Russia.

TCHERKASY (Polish *Czerkasy*), a district town of Russia, in the government of Kieff, and 190 miles by rail to the southeast of Kieff, on the right bank of the Dnieper. The population has rapidly increased lately, and has doubled since 1846, reaching 15,740 in 1883.

TCHERNIGOFF, a government of Little Russia, on the left bank of the Dnieper, bounded by Moghileff and Smolensk on the north, Orel and Kursk on the east, Poltava on the south, and Kieff and Minsk on the west, has an area of 20,233 square miles.

The population, which is rapidly increasing, reached 1,996,250 in 1883. It is chiefly Little Russian (85.6 per cent.); Great Russians (6.1 per cent.) mostly Raskolniks, and White Russians (5.6 per cent.) inhabit the northern districts. Jews have spread rapidly since last century, and now number more than 45,000. There are, besides, some 20,000 Germans as well as Greeks at Nyezhin. Agriculture is the principal occupation; in the north, however, many of the inhabitants are engaged in the timber trade and various domestic industries.

Tchernigoff, capital of the above government, stands on the right bank of the Desna, nearly half a mile from the river, 476 miles from Moscow. The population (19,000 in 1885, one-third being Jews), is almost stationary.

TCHERNOMORSK, a government of Caucasia, Russia, consisting of a narrow strip of land between the main Caucasus chain and the Black Sea, formerly inhabited by the Adyghe mountaineers of Caucasus. This strip, protected by the mountains from the cold winds of the north, is in respect of climate one of the most favored parts of the Black Sea littoral. Owing to extensive emigrations of its inhabitants to Turkey since the Russian conquest of 1864, it is very thinly peopled, the population numbering but 25,980, mostly Russians, on an area of 2,824 square miles.

Agriculture is carried on, but only in the south,—gardening and the culture of the vine and tobacco being the chief occupations besides fishing and hunting. Some manufactures are rising up at Novorossiysk (3,330 inhabitants) and Anapa (5,350), the two principal towns, which also have some foreign trade. The region is a separate province under a military governor residing at Novorossiysk, where a new harbor is being constructed.

TCHISTOPOL, a district town of Russia, in the government of Kazañ, ninety miles to the southeast of that town, on the left bank of the Kama. The population in 1883 was 18,200.

TCHITA, capital of Transbaikalia, Eastern Siberia, stands 585 miles east of Irkutsk, on the Tchita river, half a mile above its junction with the Ingoda. It was founded in 1851; and military considerations led to the selection of this very small village to be the capital of Transbaikalia. The population of Tchita in 1883 was 12,600. The inhabitants support themselves by agriculture, by trade in furs, cattle, hides, and tallow, which are brought from the Buriats, and in all kind of manufactured wares imported from Russia and Western Siberia.

TEA. This important food auxiliary, now in daily use as a beverage by probably one-half of the population of the world, is prepared from the leaves of one or more plants belonging to the natural order *Ternströmiaceæ*. The order includes the well-known ornamental genus of shrubs *Camellia*, to which indeed the tea-plants are so closely allied that by many systematic writers they are included in the same genus. The tea-plants have been cultivated in China for at least 1,000 years.

The cultivated varieties of tea, being comparatively hardy, possess an adaptability to climate excelled among food plants only by the wheat. The limits of actual tea cultivation extend from 39° N. latitude in Japan, through the tropics, to Java, Australia, Natal, and Brazil in the southern hemisphere. The tea-plant will even live in the open air in the south of England, and withstand some amount of frost, when it receives sufficient summer heat to harden its wood. But comparatively few regions are suited for practical tea-growing.

According to Chinese legend, the virtues of tea (*cha*, pronounced in the Amoy dialect *té*, whence the English name) were discovered by the mythical emperor Chin-nung, 2737 B. C., to whom all agricultural and medicinal knowledge is traced. From China a knowledge of tea was carried into Japan, and there the cultivation was established about the beginning of the thirteenth century. Seed was brought from China by the priest Miyoye, and planted first in the south island, Kiushiu, whence the cultivation spread northward till it reached the high limit of 39° N. To the south tea cultivation also spread into Tong-king and Cochin China, but the product in these regions is of inferior quality. Till well into the nineteenth century it may be said that China and Japan were the only two tea-producing countries, and that the product reached the western markets only through the narrowest channels and under most oppressive restrictions.

In the year 1826 the Dutch succeeded in establishing tea gardens in Java. At an early period the East India Company of Great Britain, as the principal trade intermediary between China and Europe, became deeply interested in the question of tea cultivation in their eastern possessions.

In January, 1840, the Assam Company was formed, and thenceforward the cultivation of tea in India was carried on. The tea districts of India include, in the order of their priority, Assam, Dehra Dun, Kumaun, Darjiling, Cachar, Kangra, Hazaribagh, Chittagong, Tarai, and the Nilgiris (Madras).

Attempts were repeatedly made to introduce tea culture in Ceylon, under both Dutch and British authority. No permanent success was attained till about 1876, when the disastrous effects of the coffee-leaf disease induced planters to give serious attention to tea. Since that period the tea industry has developed in Ceylon with marvelous rapidity, and it has every prospect of taking the first rank among Singalese productions. Tea-planting has also been successfully established in Natal. But beyond the regions above enumerated the industry has never taken root. It has been tried in the West Indies, the Southern States of America, Brazil, Australia, and the south of Europe; but cheap labor is a *sine qua non* of success. Tea can be picked in China and the British East Indies for two or three pence a day of wages, and it is on such exceedingly moderate outlay that the margin of profit depends.

Tea is more or less cultivated for local consumption in all provinces of China except the extreme north, but the regions from which it is exported are embraced within the provinces in the southeast—Kwang-tung, Fuh-keen, Keang-se, Che-keang, Keang-su, and Ganhwuy. Black-tea manufacture belongs to the more southerly portion of these regions, the green-tea country lying to the north. The methods employed in cultivating the plants and in making tea in China differ widely in various districts, and the teas retained for native use—especially the high-class fancy teas which are never seen abroad, and would probably not bear exportation—undergo special manipulation. The teas exported are of three principal classes—black tea, green tea, and brick tea.

In cultivation, the young plants are not ready for picking till they are three years old, by which time they should be well established, throwing out young shoots or "flushes" with vigor and profusion. It is these tender shoots, with leaf-buds and expanding leaves, which alone are gathered for tea manufacture, and the younger the leaf-bud the better is the quality of the tea. According to Chinese statements there are four gatherings of leaves in the year. The first is made early in April, when the young leaf-buds are just unfolding, and these, covered below with their fine silky hairs, are taken for making pekoe or young hyson. The second gathering takes place about the beginning of May, another in July, and the fourth in August and September. On each succeeding occasion the product is less fragrant and valuable, and the final gathering is said to consist of large leaves of little value. These statements do not, however, accord with Indian experience.

The following brief outline of the Chinese tea-making processes is given by Mr. Ball (*Cultivation and Manufacture of Tea*):—

"The leaves of black tea are exposed to the sun and air on circular trays and treated as hay, during which an incipient saccharine fermentation is supposed to take place in conjunction with a volatile oil. Various modifications of flavor are thus produced by the management of this fermentation; a loss of tannin takes place by the conversion of part of the tannic acid into sugar. During this change the leaves become flaccid, and slightly tinged or spotted with red or brown coloring matter, and give out a peculiar odor, approximating to, or, as some think, identical with, the odor of tea. A certain change in this odor is carefully watched by the workmen, this being an indication that the roasting must not be delayed. It is not necessary to wait till the leaves are spotted with red. They are then roasted in an iron vessel, and afterward rolled with the hands, to express their juices. The roasting and rolling are repeated so long as any juices can be expressed from the leaves in the act of rolling. Finally, they are dried in sieves placed over a charcoal fire in drying tubes, during which the leaves are occasionally taken from the fire, and turned until completely dried. It is in this last stage of the process that the leaves turn black, though this change of color is mainly due to the process of manipulation previous to roasting, and not to the action of heat.

"The leaves of green tea are roasted also in an iron vessel, but as soon as gathered, without any previous manipulation, all heating or fermentation of the leaves being studiously avoided; they are then rolled as black tea, and finally dried in the same vessel in which they have been roasted, by constantly stirring and moving them about. They are also fanned to hasten evaporation, and the drying and formation of the peculiar characteristic color of this tea, which it gradually acquires in this process, and which resembles the bloom on some fruits."

The color of genuine green tea is entirely due to the rapid drying of the fresh leaves, which prevents the chlorophyl from undergoing any alteration. The green tea sent out of China is almost invariably faced or glazed with artificial coloring matter, principally with a powdered mixture of gypsum and Prussian blue.

The names distinguishing commercial qualities of tea are almost entirely of Chinese origin. In general they indicate a gradation of qualities from the fine and delicate product of the young leaf-bud up to the hard and woody expanded and partly-grown leaf. The following list represents the ordinary series of qualities, beginning with the finest:—

Black Tea.—Flowery pekoe, orange pekoe, pekoe, pekoe souchong, souchong, congou, bohea.

Green Tea.—Gunpowder, imperial, hyson, young hyson, hyson skin, caper.

Of these names, pekoe is derived from *pak-ho* (white hairs), the pekoes showing the fine downy tips of the young buds; souchong is from *siaou-chung*, little plant or sort; congou (*kung-fu*), labor; bohea (*wu-i*), the mountains in Fuh-keen, the center of the black-tea country; and hyson (*yütsien*), before the rains, or *tu-chun*, flourishing spring. Many other names occur in the trade denoting teas of special qualities or districts, such as oolong (black dragon) and twankay, from the district of that name in the province of Keangsu. Scented teas also form a special class of Chinese produce. In scenting the finished tea, either black or green is intimately intermixed with odoriferous flowers and left in a heap till the tea is fully impregnated with the odor, when the two substances are separated by sifting, and the tea so scented is immediately packed and excluded from the air.

Brick tea is the special form in which tea is prepared for use throughout the vast tracts of Central Asia. It is made principally from broken leaves, stalks, and fragments of large leaves, compressed into blocks of various sizes. The bricks are of various degrees of compression, some being lightly squeezed into a loose mass and sewed up in cowhide bags, while others form compact resonant cakes, in which all trace of the original leaf structure is lost, with gilt characters impressed in their surface. Brick tea is much in demand over an area greater than the whole of Europe, and by many tribes it is stewed with milk, salt, and butter or other fat and eaten as a vegetable. The Russian factors established in Hoo-pih prepare two sizes of brick tea, which they send off in great quantities through the Kalgan Gate of the Great Wall.

Under European supervision the cultivation and especially the manufacture of tea have in India undergone remarkable improvements. Indeed, the traditional and empirical teaching and processes of China proved a most serious stumbling block to the progress of the tea industry under Western auspices. The tea-plants now cultivated in India are of three principal classes —the indigenous Assam, the Chinese, and a hybrid between the two. By much crossing and intermixture the gradations from one extreme to the other are almost imperceptible. The best qualities of black teas are made from indigenous and high-class hybrid plants, but these are comparatively tender and require a close, humid climate. The hardiness of the Chinese plants is their most important characteristic, for, favorably situated, the Assam plant gives a larger yield of delicate young leaf during the season than any other.

The manufacture of black tea is found to be an essentially simple matter. Many of the processes employed by the Chinese are quite superfluous, and several of the manual operations which bulk largely in the Chinese manufacture, it is found, can with advantage be supplanted by mechanical agency. The whole object of the black-tea manufacturer is to ferment, roll, and dry the leaf, and for that purpose the leaves undergo—(1) withering, (2) rolling, (3) fermenting, and (4) firing or dholing. Between the fermenting and the firing operations it is desirable to expose the leaves to the direct sunlight for an hour or thereabout. This cannot always be done, as it is impossible to keep the fermented leaves after they have attained their proper state; nevertheless, the best result is always attained in bright weather, when it is possible to expose the fermented leaves to the sun.

The fresh leaves from the garden, as they are brought in to the factory, are withered by being spread evenly over square wicker-work trays—leaf challanies—thickly or thinly, as the weather is hot or cool. Thus they are left exposed to the air till they become quite soft and flaccid, folding together when pressed in the hand into a clammy mass without crackling or rebound. In cloudy or rainy weather it becomes necessary to wither by machine, acting on the leaves with artificially dried and heated air. Withering is a preliminary to rolling, in which the flaccid and velvety leaves are kneaded, twisted, and rolled back and forward over a table till the whole comes into a mashy condition by the exudation of juice. While in Chinese tea-making that juice is squeezed out of the leaves, in India it is most carefully lapped up and absorbed in the spongy mass. In hand-rolling as much as can be worked between two hands is operated on, and passed from man to man along the table till fully worked, when it is made up into a compressed ball and so put aside for fermenting. This process is the distinguishing feature of black-tea making, and on its sufficient accomplishment depends much of the character and quality of the tea made. The progress of the fermentation must be carefully watched, and at the point when by the color it is known to be sufficiently advanced the tea is in favorable weather sunned by exposure, thinly spread out to the sunlight for about an hour. It is immediately thereafter fired, either by the fumes of burning charcoal or by a current of dried and heated air from one of the numerous machines now in use. With this single firing the process is completed, and the tea so finished is sifted by machinery into commercial qualities according to the size of the leaf.

For the entire range of manufacturing operations numerous forms of machinery and mechanical devices have been adapted and introduced in Indian gardens, so that, apart from picking the leaves, tea-making has become practically a factory industry.

The manufacture of green tea is comparatively little prosecuted in India. In Europe the demand has greatly fallen away, and, though the consumption is considerable in the United States, the supply is principally drawn from Japan, where its preparation is extensively practiced. The manufacture as carried on in the Northwestern Provinces resolves itself into a rapid rolling and drying of the leaf. Without permitting the leaves to wither after gathering, they are, if free from moisture, at once by exposure to a brisk heat sweated and softened for rolling. They are then without delay rolled as in black-tea manufacture, next spread out in the sun till they take a blackish tinge, then again rolled, and this rolling and exposure may be repeated yet a third time. When the rolling is completed the tea is placed in a highly heated pan, in which it is stirred about briskly till the whole mass becomes too hot to be worked by hand. Then it is tightly packed in a strong canvas bag, in which it is beaten by a heavy flat stick to consolidate it, and in this condition left for a night. Next day it is fired off in a pan, beginning with a high heat, which is gradually reduced during the nine hours or thereabout of the operation, an incessant stirring and tossing being kept up the whole time. During this firing off the green color of the tea is developed; and Indian green tea never owes any of its color to "facing" with foreign substances.

The qualities of a sample of tea and its commercial value can only with accuracy be determined by actual infusion and trial by a skilled tea-taster. Certain general and external appearances which indicate the class of a tea are obvious enough; but, although a pekoe may be readily distinguished from a souchong, the souchong of certain planters or districts may be more valuable than other pekoes. While it is impossible to define the conditions which determine the commercial value of an ordinary black tea, Colonel Money lays down the following rules: the darker the liquor the stronger the tea, and the nearer the approach of the infused leaf to a uniform salmony brown the purer the flavor. Black tea of good quality should in infusion yield a clear bright brown liquor emitting a subdued fragrance, and in taste it should be mild, bland, and sweetish, with an agreeable astringency. Green tea yields a light-colored liquor of high fragrance, but thin, sharp, and somewhat rasping in taste as compared with black tea.

TEAK may justly be called the most valuable of all known timbers. For use in tropical countries it has no equal, and for certain purposes it is preferable to other woods in temperate climates also. Its price is higher than that of any other timber, except mahogany. Great efforts have been made to find substitutes, but no timber has been brought to market in sufficient quantities combining the many valuable qualities which teak possesses.

It is a large deciduous tree, of the natural order *Verbenaceæ*, with a tall straight stem, a spreading crown, the branchlets four-sided, with large quadrangular pith. It is a native of the two Indian peninsulas, and is also found in the Philippine Islands, Java, and other islands of the Malay Archipelago. In India proper its northern limit is 24° 40′ on the west side of the Aravalli Hills, and in the center near Jhansi, in 25° 30′ N. latitude. In Burmah it extends to the Mogoung district, in latitude 25° 10′. In Bengal or Assam it is not indigenous, but plantations have been formed in Assam as far as the 27th parallel. In the Punjab it is grown in gardens to the 32d.

The principal value of teak timber for use in warm countries is its extraordinary durability. In India and in Burmah beams of the wood in good preservation are often found in buildings several centuries old, and instances are known of teak beams having lasted more than a thousand years. Being one of the few Indian timbers which are really durable, teak has always been used for buildings, particularly for temples, and in India it has been the chief timber employed for shipbuilding. When iron commenced to be extensively used for the last-named purpose, it was supposed that the demand for teak would decrease. This, however, has not been the case, for the wood is still very largely used for the backing of iron-clads and for decks of large vessels. It is also used for furniture, for door and window frames, for the construction of railway carriages, and for many other purposes. White ants eat the sapwood, but rarely attack the heartwood of teak. It is not, however, proof against the borings of the teredo, from whose attacks the teak piles of the wharves in the Rangoon river have to be protected by a sheathing of metal.

Once seasoned, teak timber does not split, crack, shrink, or alter its shape. In these qualities it is superior to most timbers. In contact with iron, neither the iron nor the teak suffers, and in this respect it is far superior to oak. It is not very hard, is easily worked, and takes a beautiful polish. It has great elasticity and strength, and is not very heavy. The average weight of perfectly seasoned wood fluctuates between thirty-eight and forty-six pounds per cubic foot. Its weight, therefore, is a little less than that of English oak. Green teak timber, however, is heavier than water, and unless thoroughly seasoned it cannot be floated.

Teakwood contains an aromatic oil, which gives it a peculiarly pleasant smell and an oily surface when fresh cut. To this oil may probably with justice be ascribed its great durability.

The leaves of the teak tree contain a red dye, which in Malabar was formerly used to dye silk and cotton. Natives of Burmah use the leaves as plates, to wrap up parcels, and for thatching.

In its youth the tree grows with extreme rapidity. Two-year-old seedlings on good soil are five to ten feet high, and instances of more rapid growth are not uncommon. In the plantations which have been made since 1856 in Burmah, the teak has on good soil attained an average height of sixty feet in fifteen years, with a girth, breast high, of nineteen inches.

TEAL (Old English TELE), a word of uncertain origin, but doubtless cognate with the Dutch *Taling* (formerly *Talingh* and *Telingh*), and this apparently with the Scandinavian *Atteling-And* (Brünnich, *Ornithol. Borealis*, p. 18) and *Atling*, which it seems impossible not to connect with the Scottish *Atteile* or *Atteal*, to be found in many old records, though this last word (however it be spelled) is generally used in conjunction with Teal, as if to mean a different kind of bird; and commentators have shown a marvelous inaptitude in surmising what that bird was.

The Teal is the *Anas crecca* of Linnæus, and the smallest of the European *Anatidæ*, as well as one of the most abundant and highly esteemed for the table. It breeds in many parts of Europe, making its nest in places very like those chosen by the Wild Duck, *A. boscas*; but there is no doubt that by far the greater number of those that are taken in decoys, or are shot, during the autumn and winter are of foreign origin. While the female presents the usual inconspicuous mottled plumage of the same sex in most species of *Anatinæ*, the male is one of the handsomest of his kind. His deep chestnut head and throat are diversified on either side by a line of buff, which, springing from the gape, runs upward to the eye, in front of which it forms a fork, one prong passing backward above and the other below, inclosing a dark glossy-green patch, and both losing themselves in the elongated feathers of the hind-head and nape. The back and sides of the body appear to be gray, an effect produced by delicate transverse pencilings of black on a dull white ground. The outer lanceolate scapulars have one-half of their webs pure white, forming a conspicuous stripe along the side of the back. The breast is of a pale salmon or peach-blossom color, each feather in front bearing a roundish dark spot, but these spots lessen in number and size lower down, and the warm tint passes into white on the belly. The tail-coverts above and below are velvety black, but those at the side are pale orange.

The Teal inhabits almost the whole of Europe and Asia—from Iceland to Japan—in winter visiting Northern Africa and India. It occasionally occurs on the western shores of the Atlantic; but its place in North America is taken by its representative, *A. carolinensis*, the male of which is easily to be recognized by the absence of the upper buff line on the side of the head and of the white scapular stripe, while he presents a whitish crescentic bar on the sides of the lower neck just in front of the wings.

TECHNICAL EDUCATION. The special education, the object of which is to train persons in the arts and sciences that underlie the practice of some trade or profession, is technical education. Schools in which this training is provided are known as technical schools. In its widest sense, technical education embraces all kinds of instruction that have direct reference to the career a person is following or preparing to follow; but it is usual and convenient to restrict the term to the special training which helps to qualify a person to engage in some branch of productive industry This education may consist of the explanation of the processes concerned in production, or of instruction in art or science in its relation to industry, but it may also include the acquisition of the manual skill which production necessitates. The term technical, as applied to education, arose from the necessity of finding a word to indicate the special training which was needed in consequence of the altered conditions of production during the present century. While the changed conditions of production, consequent mainly on the application of steam power to machinery, demanded a special training for those who were to be engaged in productive industry, the prevalent system of education was not adapted to the requirements of these persons, and schools were wanted in which the necessary instruction could be obtained. Other circumstances, resulting mainly from the application of steam power to machinery, have rendered technical education necessary.

A complete system of technical education should provide necessary instruction for the different classes of persons engaged in productive industry. It is usual to divide these persons into three classes:—(1) workmen or journeymen; (2) foremen or overseers; (3) managers or masters.

The industries in which they are employed may be grouped under four heads:—(1) those involving the use of extensive machinery, such as iron and steel manufacture, machine making, the textile industries, and some of the chemical trades; (2) those which mainly require the use of hand tools, as cabinet-making, brickwork, plumbing, and tailoring; (3) those depending on artistic skill, as wood and stone carving, metal-chasing, decorative work, and industrial designing generally; (4) agriculture in all its branches. These industries will be referred to as manufactures, handicrafts, art industries, and agriculture. The foregoing classification comprises groups which necessarily, to some extent, overlap one another. Every factory contains a carpenter's and smith's shop, and handicraftsmen of group (2) are required in every manufacturing concern. While the industries in which hand labor is exclusively employed are becoming fewer and fewer, there are many trades which, owing to the frequent invention of labor-saving appliances, are passing graduully from the class of handicrafts to that of manufactures. In these trades, of which watch and clock making and boot and shoe making may be taken as examples, there is still a demand for goods largely if not entirely produced by hand work. In such trades, owing to the absence of facilities for instruction in the ordinary shops, there is a want of skilled hand labor which there is an increasing difficulty in satisfying, and to supply this want technical schools of different kinds have been established. Then, again, there are many branches of manufacturing industry which greatly depend for their success upon the designer's art, and it is necessary that the industrial designer should possess a knowledge of the processes of the manufacture in which his designs will be utilized, as well as of the properties and capabilities of the material to which they will be applied. Indeed, it is the possession of this knowledge which mainly distinguishes the industrial designer from the ordinary artist. To determine the best training for such designers is one of the problems of technical education. There are many trades, too, in which the handicraftsman and the designer should be united. This is the case in such industries as wood-engraving, metal chasing, and silversmith's work. In these and other trades the true artisan is the artist and handicraftsman combined.

In order to reconcile some of the different views, which are held as to the objects of technical education, it is necessary to keep in mind the broad distinction above referred to, between the conditions of production on a large scale, as in those industries in which goods are manufactured by the use of extensive labor-saving machinery, and in those trades in which hand work is chiefly employed. Much of the diversity of opinion regarding the objects of technical education is due to the difference of standpoint from which the problem is regarded. The volume of the trade and commerce of Britain depends mainly on the progress of its manufacturing industries. It is these which chiefly affect the exports and imports. The aim of manufacturers is to produce cheaper and better goods than can be produced by other manufacturers at home or abroad; and technical education is valuable to them, in so far as it enables them to do so. But the artisan engaged in hand industries looks to technical education for the means by which he may acquire a knowledge of the principles of his trade, which the absence of the system of apprenticeship prevents him from acquiring in the shop. Hence the artisan and the manufacturer approach the consideration of the question from different sides. To the spinner or weaver who almost exclusively employs women to tend his machinery, or to the manufacturing chemist whose workpeople are little more than laborers employed in carrying to and fro materials, knowing little or nothing of the scientific principles underlying the complicated processes in which they are engaged, the technical education of the workpeople may seem to be a matter of little moment. What such manufacturers require are the services of a few skilled engineers, artistic designers, or scientific chemists. From the manufacturer's point of view, therefore, technical instruction is not so much needed for the *hands* he employs in his work as for the *heads* that direct it. But in trades in which machinery plays a subsidiary part, technical teaching supplies the place of that instruction which, in former times, the master gave to his apprentice, and the workman looks to it to supply him with the knowledge of the principles and practice of his trade, on the acquisition of which his individual success greatly depends. In the former class of industries, technical education is needed mainly for the training of managers; in the latter, for the training of workmen. Hence has arisen a double cry—for the teaching of art and of the higher branches of science, with a view to their application to manufacturing industry, and for the teaching of trades, and of the scientific facts which help to explain the processes and methods connected with the practice of these trades. This double cry has led to the establishment of technical universities and of trade schools.

Owing to the conditions under which manufacturing industry is now carried on, it is difficult to select competent foremen from the rank and file of the workmen. The ordinary hands gain a very limited and circumscribed acquaintance with the details of the manufacture in which they are engaged, and have little opportunity of acquiring that general knowledge of various departments of work, and of the structure of the machinery in use, which is essential to the foreman or overseer. It is in evening technical classes that this supplementary instruction, which it is the workman's interest to acquire and the master's to encourage, can be obtained. The history of invention shows how frequently important improvements in machinery are made by the workman or minder in charge of it, and adds weight to the arguments already adduced for giving technical instruction to persons of all grades employed in manufacturing industry. To these advantages of technical education, as affecting the workmen themselves as well as the progress of the industry in which they are engaged, must be added the general improvement in the character of the work produced, resulting from the superior and better-trained intelligence of those who have had the benefit of such instruction.

In order that the different classes of persons who are to be engaged in productive industry may receive a fitting preparatory training, the programme of elementary and secondary as well as of the higher education must be organized with reference to their special requirements. If the demand for technical instruction is to be fully satisfied, a great part of our existing system of education must be reconstructed, and the training provided in our several schools must be made a more fitting preparation for industrial work than it is at present.

Schools in which the course of instruction is not specialized with a view to any particular industry, but is so arranged as to form a general preparation for manufacturing or other trade pursuits, are often spoken of as professional, technical, or trade schools; but such schools must be distinguished from apprenticeship schools, the object of which is to teach trades. Of the former class of schools there are excellent examples in the different countries of Europe as well as in the United States, and some few have recently been established in the United Kingdom. Of the latter class the best examples are found in France and Austria. The study of these schools, and of the means of providing fitting education for the different classes of producers, may be simplified by a statement of the following propositions:—

1. The ordinary education of all persons who are likely to be engaged in productive industry should be determined by the general requirements of their future work. This proposition affects the curriculum of all

schools in which different classes of producers are to be trained, *i.e.*, of primary, secondary, and higher schools, and involves the consideration of the extent to which, in such schools, modern languages, science, drawing, and manual instruction should take the place of literary and classical studies.

2. Special schools or classes should be established (*a*) for instruction in art, and in those sciences which serve to explain the processes of productive industry, including agriculture, manufactures, and engineering; (*b*) for instruction in the application of art and science to these departments of industry; and (*c*) for the teaching of, and in certain cases for practice in, various handicrafts or trades.

3. The special schools should be adapted to the requirements of the different grades of workers, and to the different kinds of work in which they are or are likely to be engaged.

TECHNOLOGY is the name given to the science or systematic knowledge of industrial arts. In its widest sense it embraces the whole field of industry, but it is restricted in usage to the more important manufactures. A complete course of instruction in technology could only be of the most superficial kind. The essential preparation for any branch of the manufacturing arts is the study of the fundamental physical sciences, which are taught in schools and universities, and the special application to the branch which the student has to pursue professionally can be best learned from special treatises on the subject in connection with practice in a manufacturing establishment. A general knowledge, however, of the arts of manufacture is interesting and instructive to all, and hence the museums of industry, recently established all over the country, which, while yet in their infancy, promise to be of lasting benefit.

TE DEUM, a well known hymn (so called from its first words) of the Roman Catholic Church, sung on all occasions of triumph and thanksgiving, and a theme upon which the most celebrated composers have from time immemorial exercised their musical genius. The hymn is one of the most simple, and at the same time the most solemn and majestic in the whole range of hymnology of the Roman Catholic Church. Its authorship is uncertain.

TEETH. See MAMMALIA; DIGESTIVE ORGANS; IVORY; and DENTISTRY.

TEGEA, one of the chief cities of Arcadia, of which its territory occupied the southeastern corner, being bounded on the south by Laconia, on the east by Cynuria and Argolis, on the north by the territory of Mantinea, and on the west by Mænalia.

Of its buildings much the most famous was the great temple of Athene Alea, which had often afforded sanctuary to fugitives from Sparta. The old temple was burned down in 394 B.C., and Pausanius speaks of the newer temple as by far the finest and largest in the Peloponnesus. The site of the temple, at the modern village of Piali, was partially excavated under the auspices of the German archæological institute in 1879 and 1882. It appears that the foundations of the temple measured 49.90 meters (nearly 164 feet) by 21.30 (70 feet). As Tegea stood on a plain surrounded by mountains and liable to inundations, its site has been covered by an alluvial soil which has been favorable to the preservation of the ruins, and a thorough excavation might yield important results.

TEGNÉR, ESAIAS, the most celebrated of Swedish writers, was born November 13, 1782, at Kyrkerud in Wermland. In 1799 Tegnér, hitherto educated in the country, entered the university of Lund, where he graduated in philosophy in 1802, and continued as tutor until 1810, when he was elected Greek lecturer. In 1812 he was named professor, and continued to work as a lecturer in Lund until 1824, when he was made bishop of Wexiö. At Wexiö he remained until his death, twenty-two years later. Tegnér's early poems have little merit. He was comparatively slow in development. His first great success was a dithyrambic war-song for the army of 1808, which stirred every Swedish heart. In 1811 his patriotic poem *Svea* won the great prize of the Swedish Academy, and made him famous. His celebrated *Song to the Sun* dates from 1817. He completed three poems of a more ambitious character, on which his fame chiefly rests. In 1820 he published in *Iduna* certain fragments of an epic or cycle of epical pieces, on which he was then working, *Frithiofs-saga* or the Story of Frithiof. In 1822 he published five more cantos, and in 1825 the entire poem. Before it was completed it was famous throughout Europe. In later years Tegnér began, but left unfinished, two important epical poems, *Gerda* and *Krombruden.* The period of the publication of *Frithiofssaga* (1825) was the critical epoch of his career. It made him one of the most famous poets of Europe; it transferred him from his study in Lund to the bishop's palace in Wexiö; it marked the first breakdown of his health, which had hitherto been excellent. In 1840, during a visit to Stockholm, he suddenly became insane. He was sent to an asylum in Schleswig, and early in 1841 he was cured, and able to return to Wexiö. It was during his convalescence in Schleswig that he wrote *Kronbruden.* He wrote no more of importance; in 1843 he had a stroke of apoplexy, and on November 2, 1846, he died in Wexiö.

TEHERAN, or, more properly, TEHRAN (latitude 35° 40′ N., longitude 51° 25′ E.), for about a century the recognized capital of Persia, has little to distinguish it, in general outward appearance, from other large cities of the country, though in quite recent years Parisian streets or boulevards, and even western architecture for single houses, in the midst of mud-brick palaces or plain mud hovels, have been incongruously introduced. Formerly a kind of polygon some four miles in circumference—with its mean "shahr panah" or wall, its clumsy and uneven ditch, and its six gates, two facing north, two south, one east, and one west—Teheran has now been extended to an outer ditch and wall, thrown out on each side beyond the ancient limit. The bazaars are good, though hardly of the first class; the caravanserais deserve honorable mention; and the telegraph and arsenal are respectable institutions. The streets are for the most part narrow and wretchedly paved.

The present population of Teheran may be taken at 160,000 at most. According to a late authority (Bassett, 1887) the European inhabitants are reckoned at about 100 only; the Jews number some 2,500; and there are 150 Gabrs or Parsis, a sorry remnant of the old fireworshipers.

TEHUANTEPEC, an isthmus in Mexico, comprising the western extremities of the states of Vera Cruz and Oajaca, and limited eastward by the states of Tabasco and Chiapas, thus lying between 16° and 18° N. latitude, and 94° and 95° W. longitude.

This favorable condition of the relief, combined with a relatively healthy climate subject only to dangerous insect pests in summer, has naturally attracted attention to the Tehuantepec isthmus, as offering peculiar advantages for interoceanic communication either by a navigable canal, a railway, or a ship railway. A first concession was made in 1841 by the Mexican Government to Don José de Garay, who had the land surveyed with a view to a canal, but who, after the war with the United States, surrendered his rights to Mr. P. A.

Hargous of New York. The company then organized to give effect to the Garay grant caused a fresh survey for a railway to be made in 1851, under the direction of the late Gen. J. G. Barnard. But nothing came of this or of another railway project in 1857, when a third survey was executed, under the direction of Col. W. H. Sidell. Then the "Tehuantepec Railway Company," formed in 1870 in New York, and reorganized in 1879, obtained a concession from the Mexican Government to construct the "Tehuantepec Railway;" but, after a few miles were made, the work was suspended, and in 1882 the government contracted with private individuals for the completion of the line. A Tehuantepec ship railway is also projected, as it is expected that most of the trade between the Atlantic and Pacific coasts of the United States will be attracted to this route, which shortens the distance between New York and San Francisco by 1,477 miles, and between New Orleans and the same place by 2,334 miles, as compared with that by the Panama railway and future canal.

TEIGNMOUTH, a seaport and market town of England, in Devonshire, consisting of the parishes of East and West Teignmouth, and situated on the English Channel, at the mouth of the Teign and on the Great Western railway, 14 miles south of Exeter and 209 west-southwest of London. The town, which is not incorporated, was formerly governed by portreeves. It now forms an urban sanitary district, which was extended on September 29, 1881. The population of the former area (1,238 acres) in 1871 was 6,751, and in 1881 it was 7,120; that of the extended area (2,347 acres) in 1881 was 8,496.

TEINDS, the name given by the law of Scotland to certain tithes. In Scotland, tithes were only paid from the produce of land or cattle. The teinds of corn, called *decimæ garbales*, greater teinds, or parsonage teinds, were generally exigible from all landed property, and were originally paid to the rector or parson serving the cure, a small portion being claimed by the bishop. The tithe of the produce of animals, as wool, milk, cheese, was called lesser teind, or vicarage teind, because, where due, it was paid to the vicar, but vicarage teind was only legally exigible where a custom of paying it could be shown.

TEKELI, a celebrated Hungarian patriot, was born at the Castle of Kasmark, in the county of Zips, Hungary, in 1656. He several times opposed the Austrians at the head of the Turks, but was finally defeated by Prince Eugene, of Savoy, in 1697, from which time he lived in retirement in Turkey, being reduced to extreme poverty. He died in Constantinople in 1705.

TELEGRAPH (from τήλε afar, and γράφω, I write) signifies an instrument to write at a distance. The term is specifically applied to apparatus for communicating intelligence to a distance in unwritten signs addressed to the eye or ear, and has only recently had application to those wonderful combinations of inanimate matter which literally write at a distance the intelligence committed to them. The chief object of the present article is to explain the principles and practice of the electric telegraph, and we shall allude to other telegraphic systems only to illustrate the general principles of signaling.

Although the history of practical electric telegraphy does not include a period of more than half a century, the idea of using electricity for telegraphic purposes is much older. It was suggested again and again as each new discovery in electricity and magnetism seemed to render it more feasible. Stephen Gray, a Charterhouse pensioner, in 1727, so charged a wire 700 feet in length as to make it attract light bodies at the distant end. In a letter in the *Scots Magazine*, from Renfrew, in 1753, signed C. M., the writer said: "Let a set of wires equal in numbers to the letters of the alphabet be extended horizontally between two places; at the end of these wires let balls be suspended against a glass sheet, and the wires striking the glass these balls would drop upon an alphabet arranged upon the table, and thus by a spelling method, communication could be made of words." A very interesting modification was also proposed in the same letter, viz., to attach to the end of each wire a small light ball which when charged would be attracted toward an adjacent bell and strike it. In 1773 Le Sage proposed a similar method, in which each conductor was to be attached to a pith ball electroscope. An important advance on this was proposed in 1787 by Lomond, who used only one line of wire and an alphabet of motions. Besides these we have in the same period the spark telegraph of Reiser, of Don Silva, and others. Francis Ronalds constructed a telegraph eight miles long, and offered it to the government, meeting with an indignant refusal. The inventor was knighted by Gladstone in 1874, and died shortly afterward aged ninety-one. Next came the discovery of Galvani and of Volta. The discovery by Nicholson and Carlisle of the decomposition of water and the subsequent researches of Davy on the decomposition of the solutions of salts by the voltaic current were turned to account in the water voltameter telegraph of Sömmering and the modifications of it proposed by Schweigger and Coxe, in which a solution of salts was substituted for water. Then came the discovery by Oersted of the action of the galvanic current on a magnet. The application of this to telegraphic purposes was suggested by Laplace and taken up by Ampère, and afterward by Triboaillet and by Schilling, whose work forms the foundation of much of modern telegraphy. Faraday's discovery of the induced current produced by passing a magnet through a helix of wire forming part of a closed circuit was laid hold of in the telegraph of Gauss and Weber, and this application was at the request of Gauss taken up by Steinheil, who brought it to considerable perfection. Steinheil communicated to the Göttingen Academy of Sciences in September, 1838, an account of his telegraph, which had been constructed about the middle of the preceding year. The receiving apparatus consisted of a multiplier, in the center of which were pivoted one or two magnetic needles, which either indicated the message by the movement of an index or by striking two bells of different tone or recorded it by making ink dots on a ribbon of paper. Among other workers about this time we may mention Masson, Bréguet, Davy, Deval, Billon, Soudalot, and Vorsselman, who proposed to use the physiological effects of electricity in working an electric telegraph.

Steinheil, who was first to utilize the earth as a return wire, or part of the line, was anticipated in the matter of a recording telegraph by Morse, who in 1835 constructed an instrument; this was afterward perfected, and is today in use everywhere (see below). In 1836 Cooke, to whom the idea appears to have been suggested by Schilling's method, invented a telegraph in which an alphabet was worked out by the single and combined movement of three needles. Subsequently, in conjunction with Wheatstone, he introduced another form, in which five vertical index needles, each worked by a separate multiplier, were made to point out the letters on a dial. Two needles were acted upon at the same time, and the letter at the point of intersection of the direction of the indices was read. This telegraph required six wires, and was shortly afterward displaced by the single-needle system, still to a large extent used on railway and other less important circuits. The single-needle instrument is a vertical needle galvanoscope worked by a battery

TELEGRAPHY, ETC.

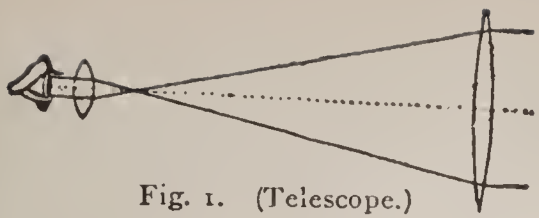


Fig. 1. (Telescope.)

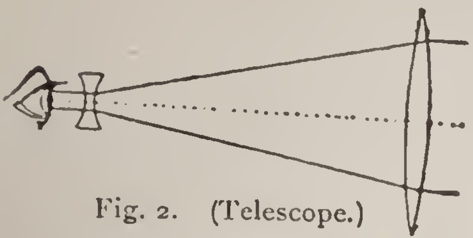


Fig. 2. (Telescope.)

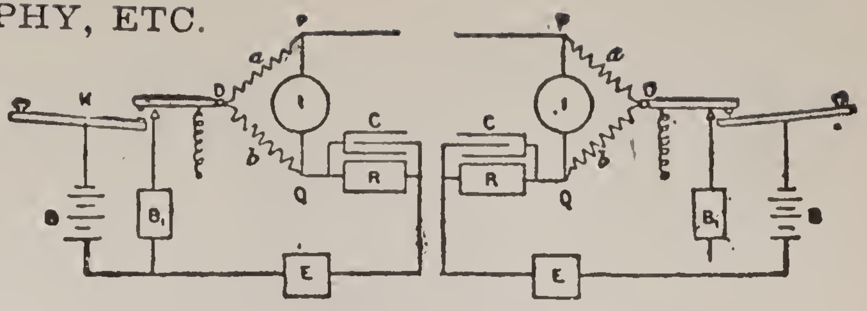


Fig. 5. (Telegraph.)

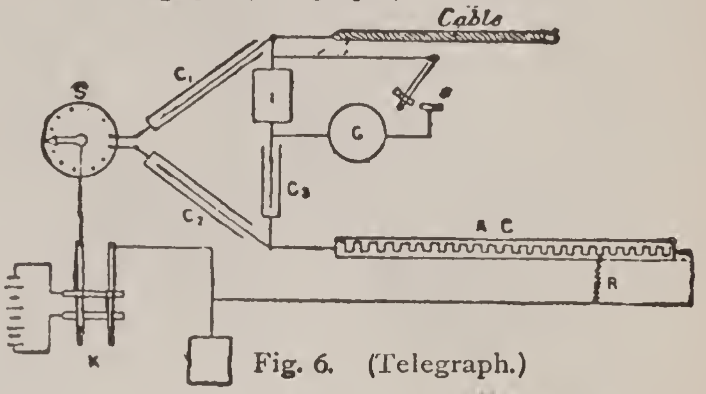


Fig. 6. (Telegraph.)

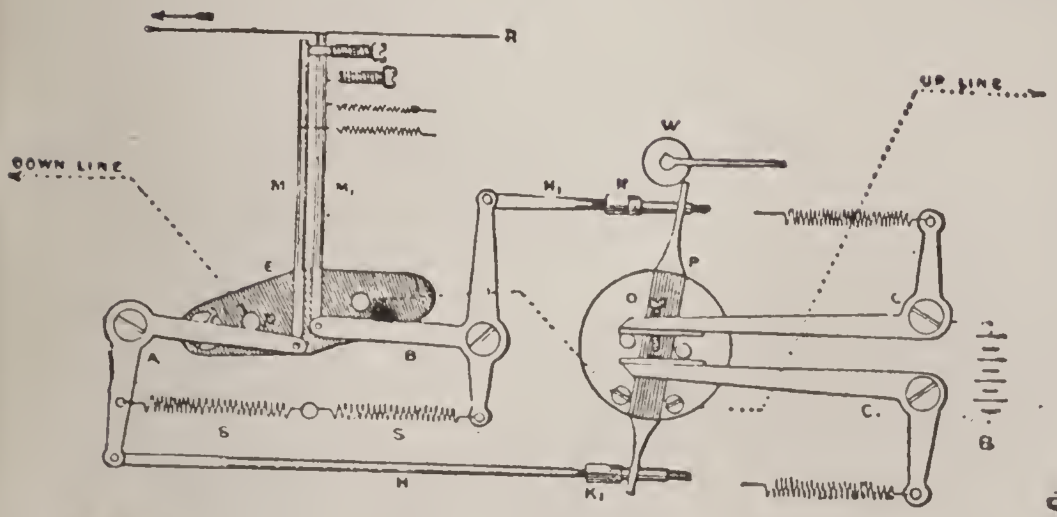


Fig. 3. (Telegraph.)

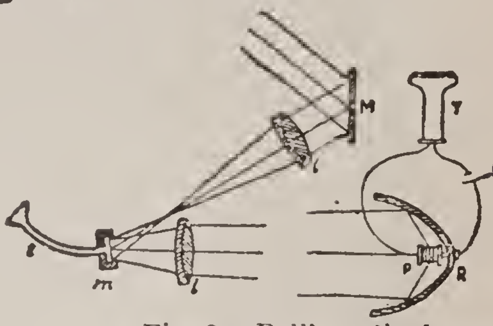


Fig. 8.—Bell's radiophone. (Telephone.)

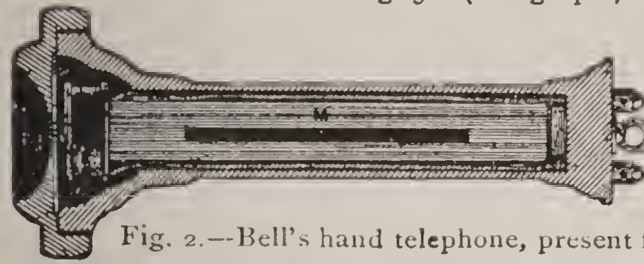


Fig. 2.—Bell's hand telephone, present form.

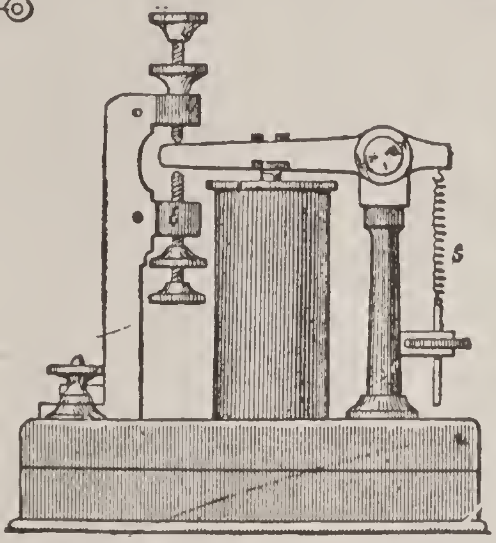


Fig. 2.—Morse sounder, one-fourth full size. (Telegraph.)

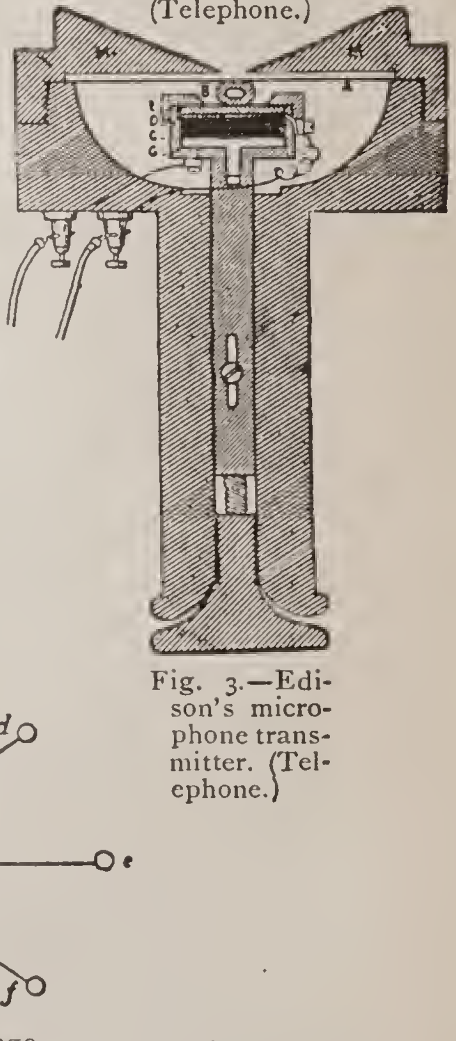


Fig. 3.—Edison's microphone transmitter. (Telephone.)

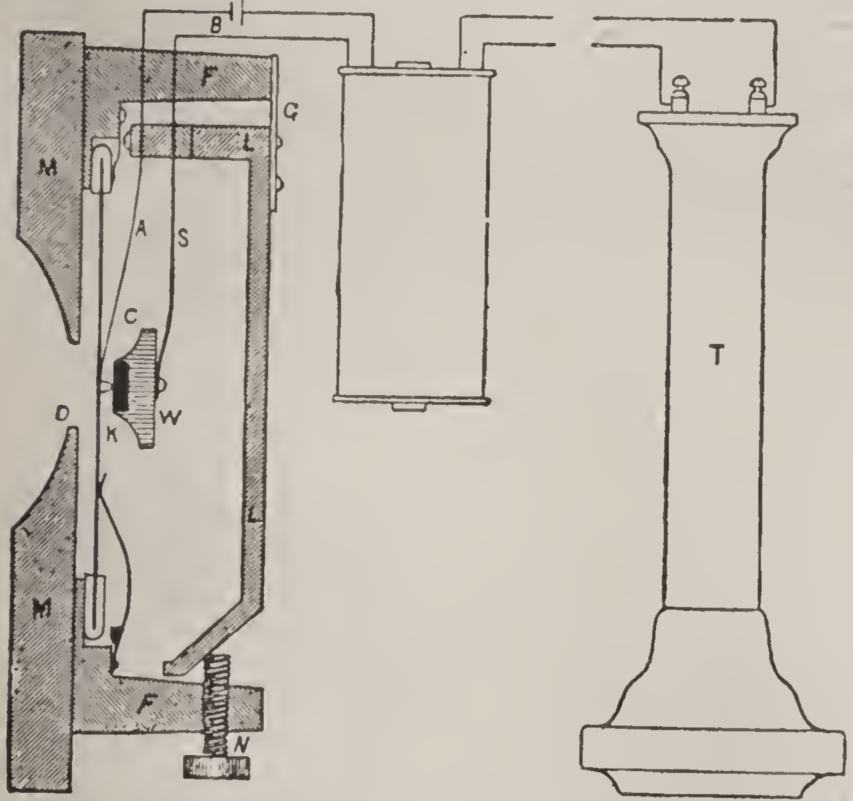


Fig. 4.—Blake's transmitter. (Telephone.)

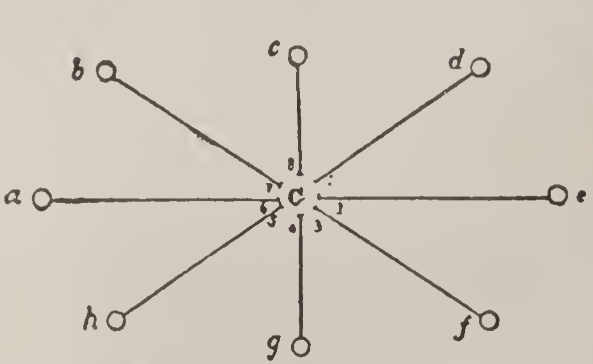


Fig. 5.—Telephone exchange.

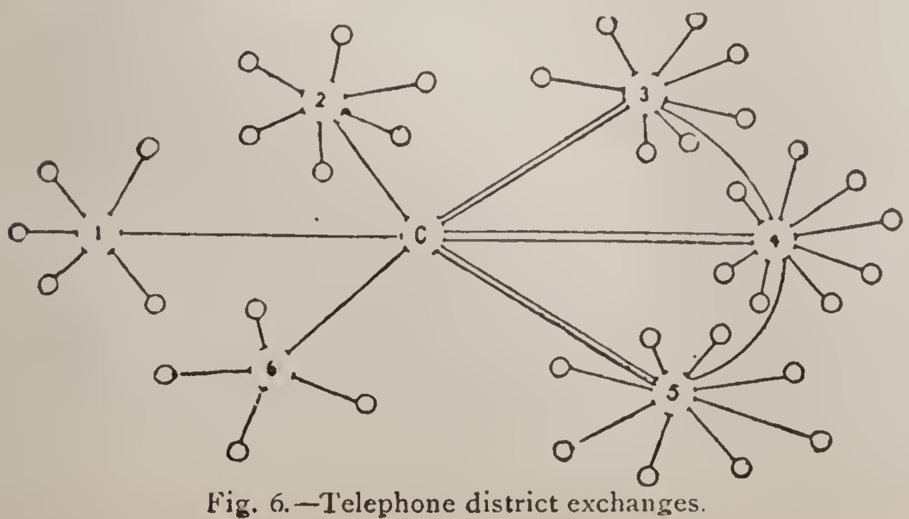


Fig. 6.—Telephone district exchanges.

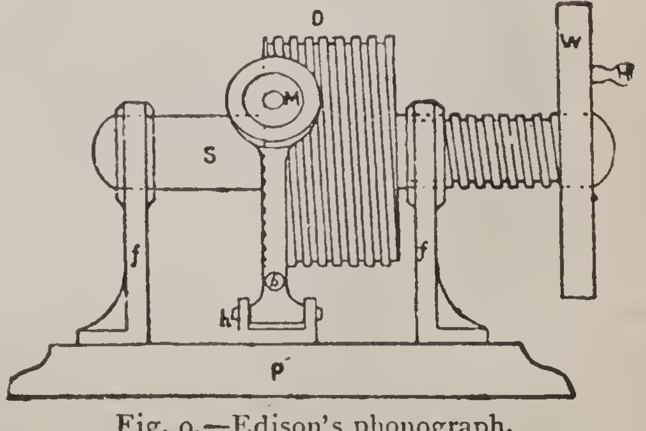


Fig. 9.—Edison's phonograph. (Telephone.)

TELESCOPES, ETC.

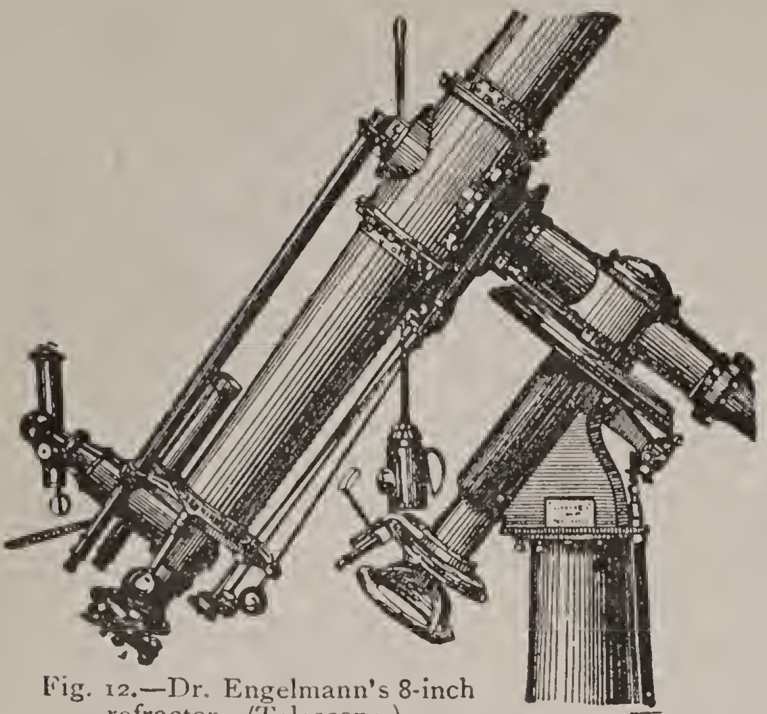


Fig. 12.—Dr. Engelmann's 8-inch refractor. (Telescope.)

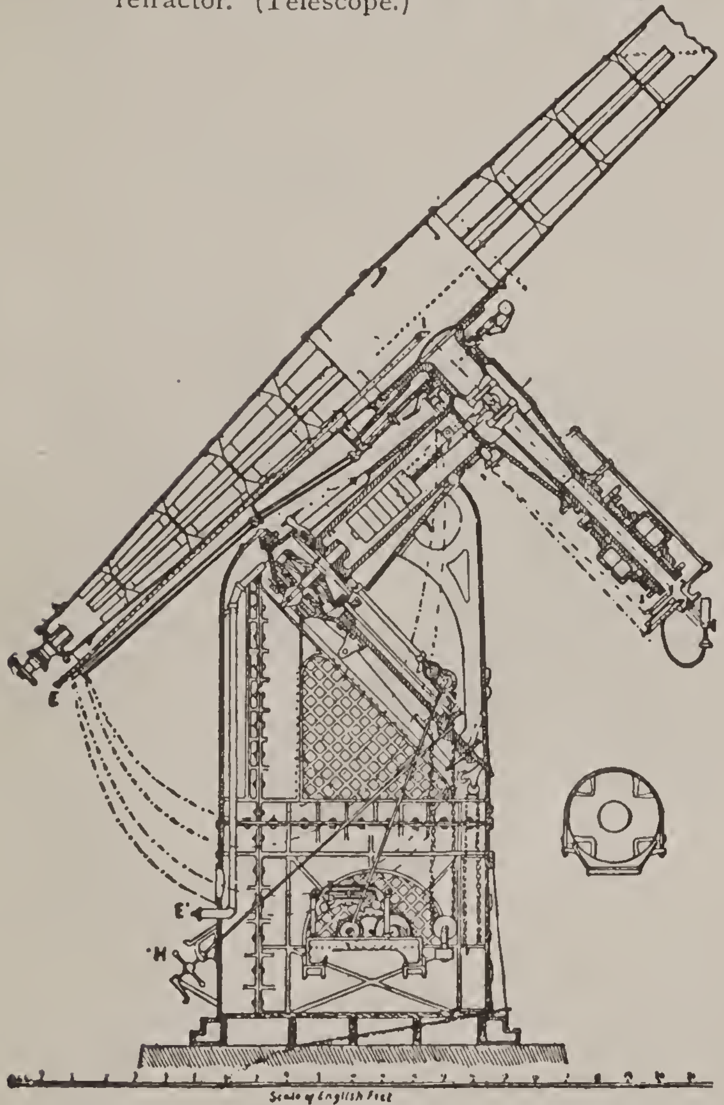


Fig. 11.—Grubb's 27-inch refractor (Vienna). (Telescope.)

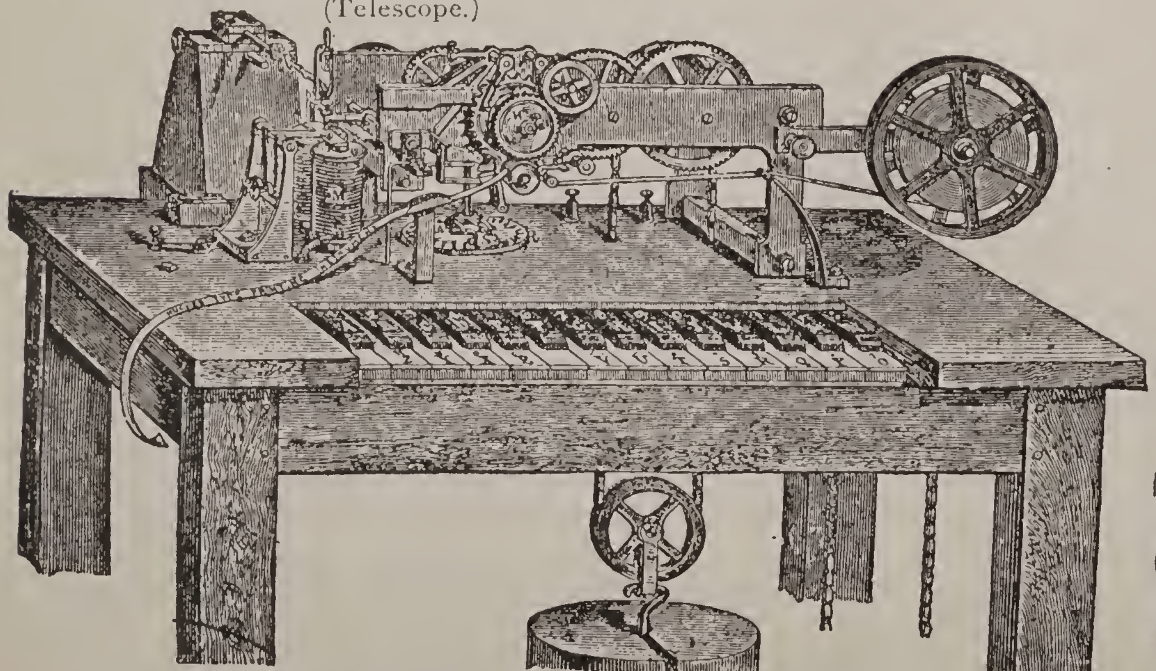


Fig. 4.—Hughes' type-printing instrument, one-tenth full size. (Telegraph.)

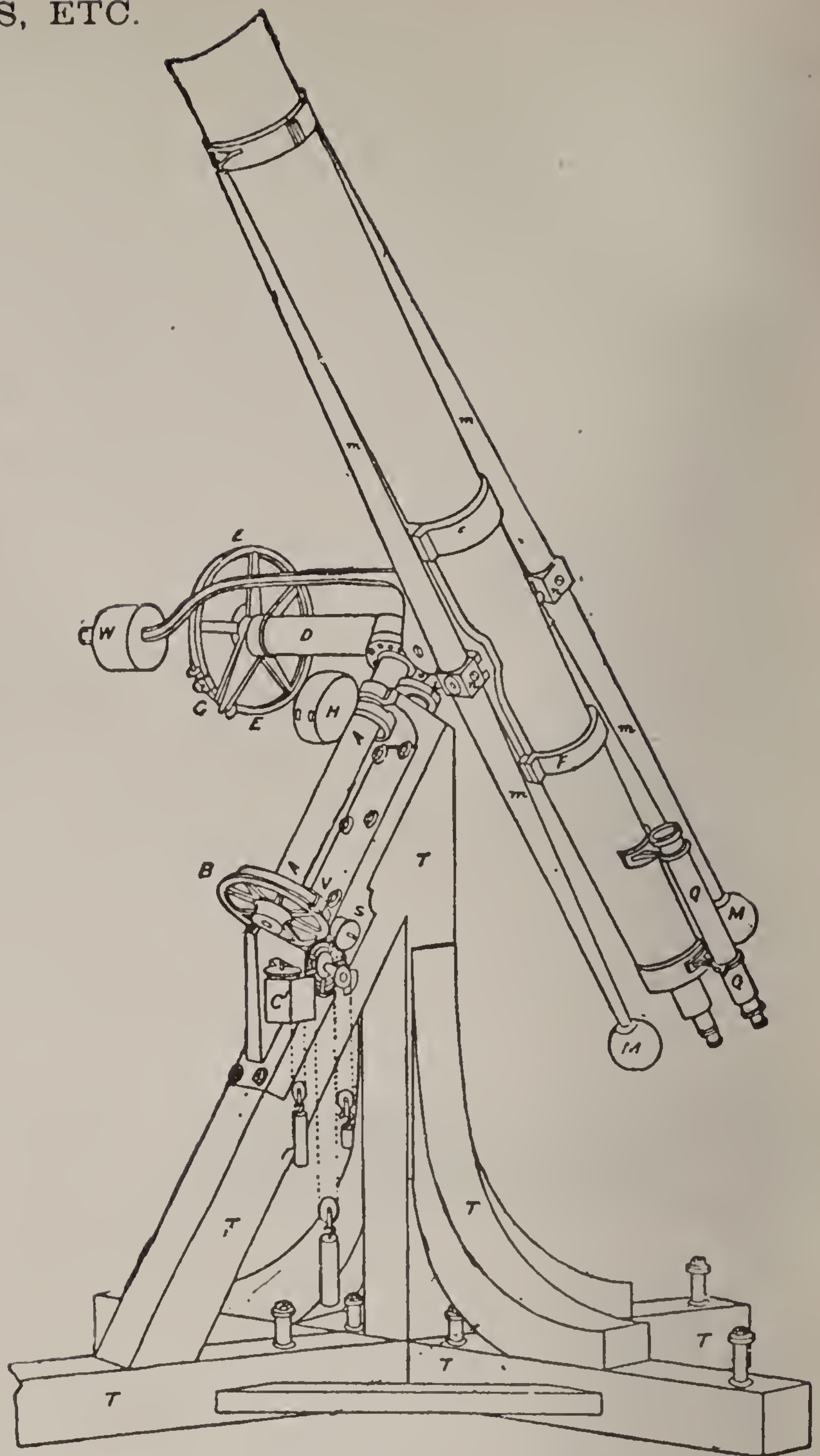


Fig. 10.—Dorpat refractor. (Telescope.)

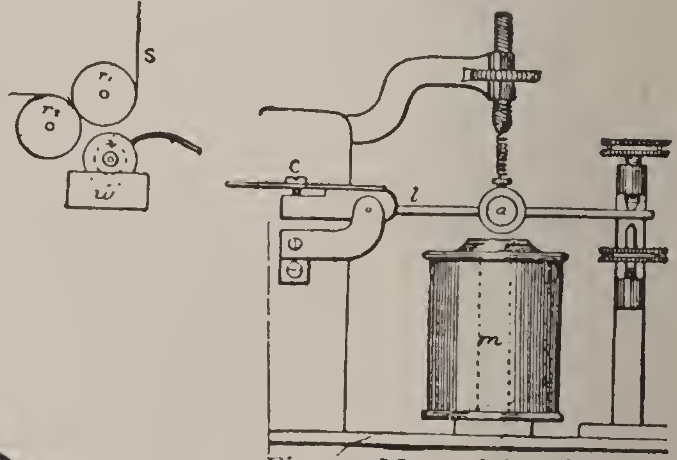


Fig. 1.—Morse ink-writer, one-fourth full size. (Telegraph.)

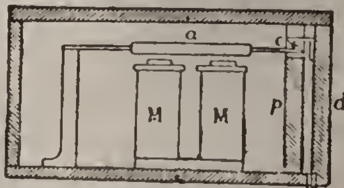


Fig. 7.—Indicator or annunciator. (Telephone.)

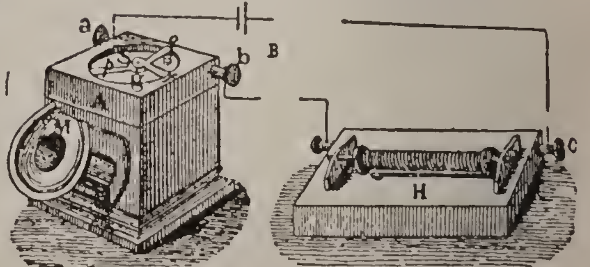


Fig. 1.—Reis' telephone.

and reversing key, the motions to right and left of one end of the index corresponding to the dashes and dots of the Morse alphabet. To increase the speed of working, two single-needle instruments were sometimes used (double-needle telegraph). This system required two lines of wire, and, along with all multiple-wire systems, soon passed out of use. Similar instruments to the single and double ones of Cooke and Wheatstone were about the same time invented by the Rev. H. Highton and his brother Edward Highton, and were used for a considerable time on some of the railway lines in England. Another series of instruments, introduced by Cooke and Wheatstone in 1840, and generally known as "Wheatstone's step-by-step letter-showing" or "A B C instruments," were worked out with great ingenuity of detail by Wheatstone in Great Britain and by Bréguet and others in France. They are still largely used for private wires, but are being rapidly displaced by the telephone. An instrument embodying the same principle, although differing greatly in mechanical detail, was brought into use by Royal E. House of Vermont, and was very successfully worked on some of the American telegraph lines till 1860, after which it was gradually displaced by the Phelps combination telegraph. The House instrument is not now in use, but various modifications of it are still employed for private lines and for stock telegraphs, such as Calahan's and the universal stock telegraphs, Phelps' stock printer, Gray's automatic printer for private lines, Siemen's and Phelps' automatic type printers, etc.

To construct a telegraph line it is necessary there should be a wire insulated from the earth, stretched between the terminals of the route. This is usually placed on poles. At one or both extremities of the line, a source of electricity, either a battery or a dynamo is placed, and the home side of this is carried to the earth. Instruments are placed at the several stations along the line through which the current of electricity passes, and by its action, moves a magnetic needle or an electro-magnet armature. By alternately "opening" and "closing" the key of any station, the wire is virtually broken and repaired. A combination of these openings and closings makes an alphabet, with which words are formed. Whatever is written goes the entire length of the line, and may be read by all, but each station has its own call, which is repeated until answered before sending a message.

The line or wire is usually of galvanized iron from one-sixth to one-quarter of an inch in diameter. This is fastened to the insulator, which in Europe is of either porcelain or glass—sometimes of earthenware. In America it is usually of glass. Where several lines run on the same line of poles, cross arms are nailed to the pole, each arm carrying several wires. When only a single insulator is required it is put on a bracket nailed to the pole or upon a pin at the top of the pole.

In the underground system the main line generally consists of a copper wire, or a thin strand of copper wires, covered with a continuous coating of gutta percha, india-rubber, or some equivalent insulating substance, served with tarred tape and inclosed in earthenware, iron, or lead pipes laid below the surface of the ground. This system is largely used for street and tunnel work, and to a considerable extent, especially in Germany, for ordinary lines. Each tube generally contains a number of wires, which are either laid up into a cable and covered with a serving of tarred tape or hemp before being drawn into the tube, or simply laid together in a parallel group and tied at intervals with binders, which are removed as the wires are drawn into the tube.

Submarine Cables.—A submarine cable, as usually manufactured at present, consists of a core in the center of which is a strand of copper wires varying in weight for different cables between 70 and 400 pounds to the mile. The stranded form was suggested by Prof. W. Thomson at a meeting of the Philosophical Society of Glasgow in 1854, because its greater flexibility renders it less likely to damage the insulating envelope during the manipulation of the cable. The central conductor is covered with several continuous coatings of gutta percha, the total weight of which also varies between 70 and 400 pounds to the mile. With a light core the weight of the gutta percha generally exceeds that of the copper, while in some heavy cores the copper is heavier. The different coatings of gutta percha and of the conductor are usually separated by a thin coating of Chatterton's compound (a mixture of gutta percha, resin, and Stockholm tar), in order to make them adhere firmly together. The core is served with a thick coating of wet jute, yarn, or hemp, forming a soft bed for the sheath, which consists of soft iron, or of homogeneous iron, wires of the best quality. The sheathing wires are usually covered with one or two servings of tarred canvas tape, or of tarred hemp, laid on alternately with coatings of a mixture of asphaltum and tar. The weight of the iron sheath varies greatly according to the depth of the water, the nature of the sea bottom, the prevalence of currents, and so on.

The code of signals introduced by Morse is still employed in the United States and Canada, and the international code in vogue in Europe differs only slightly from it. Currents in one direction only are used, and different combinations of from one to four long and short contacts form the letters, while the numerals are represented by groups of five signals, and punctuation and other special signs by groups of six and sometimes more. The instruments used for land telegraphs on this system are of two types—"sounders," which indicate by sound, and "recorders," which record the signals.

(1) Recorders vary in details of construction, but all have the same object, namely, to record the intervals during which the current is applied to the line. In the earlier forms of instrument the record was made by embossing lines on a ribbon of paper by means of a sharp stile fixed to one end of a lever, which carried at the other end the armature of an electromagnet. This method of recording is but little employed in America, but certainly has the advantage of simplicity. The form of instrument almost universally used in Europe makes the record in ink, and hence is sometimes called the "ink-writer." This method has the advantage of distinctness, and so is less trying to the eyes of the operators. The action of the instrument will be understood from the annexed sketch (fig. 1). Suppose s to be a strip of paper which is being pulled toward the left by means of two rollers r^1 and r^2 moved by a train of mechanism. Underneath the roller r^1 a small wheel i is kept turning by the same mechanism, and has its lower edge in contact with the surface of ink in the ink-well w. When a current is sent through the magnet m, the armature a is attracted and the lever l lifts the ink-wheel i into contact with the paper, against the surface of which it rolls until the current is broken, thus making a mark the length of which depends on the speed of the mechanism and the time the current flows. As the speed of the mechanism is nearly constant, the relative lengths of the marks depend only on the duration of the current. In this way the letters of the alphabet, or any other understood signs, are indicated by groups of long and short marks, commonly called "dashes" and "dots."

(2) Operators who use the recording instrument soon learn to read the message by the click of the

armature against its stop, and as this is a less fatiguing method of reading, and leaves the hands and eyes free to write, the sound is usually preferred. Thus, when it is not necessary to keep a copy, a much simpler instrument may be employed and the message read by sound. The earliest successful form was Bright's bell sounder, which consisted of two bells of distinct tone or pitch, one of which was sounded when the current was sent in one direction and the other when it was reversed. This instrument was capable of giving very considerable speed, but it was more complicated than that now in use, which consists only of an electromagnet, with its armature lever arranged to stop against an anvil or screw *b* (fig. 2) in such a way as to give a distinct and somewhat loud sound. Dots and dashes are distinguished by the interval between the sounds of the instrument in precisely the same way as they are distinguished when reading from the record by sound. The form of sounder commonly used in America and England is shown in fig. 2; it is one of the simplest possible instruments, is easily adjusted to the current by tightening or slackening the spring *s*, and is very little liable to get out of order

Another and in some respects a simpler method of recording is to use a chemically prepared ribbon of paper. Suppose, for instance, the paper ribbon to be soaked in a solution of iodide of potassium and a light contact spring made to press continuously on its surface as it is pulled forward by the mechanism. Then, if a current is sent from the spring to the roller through the paper, a brown mark will be made by the spring due to the liberation of iodine. This was the principle of the chemical telegraph proposed by Edward Davy in 1838, and of that proposed by Bain in 1846. It gives a ready means of recording on the Morse plan at a high rate of speed, and Bain's telegraph was successfully worked for some years in America. Several ingenious applications of his method have been proposed, as, for example, the copying telegraph of Bakewell and of Cros, by means of which a telegram may be transmitted in the sender's own handwriting; the pantelegraph of Caselli; the autographic telegraphs of Meyer, Lenoir, Sawyer and others; and the autographic typo-telegraph of Bonelli. The principle of action of these instruments is this: Suppose two metallic cylinders, one at the sending and the other at the receiving station, to be kept revolving synchronously, and suppose the axis of each to be threaded with a fine screw so that as it revolves rapidly it has a slow side motion. Wrap round the cylinder at the sending station a ribbon of tinfoil, or paper covered with a conducting coating, on which the message is written in varnish or some other insulating substance. Suppose, also, a ribbon of paper which has been soaked in iodide of potassium to be wrapped round the cylinder at the receiving station. Cause a stile, as in the Bain telegraph, to press on each cylinder and set it in motion. It is evident that so long as the stile at the sending end presses on the clean foil the stile at the receiving end will continue to make a brown mark, but that when it passes over the varnish the mark will be interrupted. In this way, as the two cylinders revolve and move sideways, the series of interruptions made at the receiving end form an exact copy of the varnish marks at the sending end. These instruments are at present but little used.

It has been found possible to make the Morse ink-writer so sensitive that it can record signals sent over land lines of several hundred miles in length very much faster than they can be transmitted by hand, and this has led to the adoption of automatic methods of transmission. One was proposed by Bain as early as 1846, but it did not come into use. That now employed, is however, practically a development of his idea. It consists in punching, by means of "a puncher," a series of holes in a strip of paper in such a way that, when the strip is sent through another instrument, called the "transmitter," the holes cause the circuit to be closed at the proper times and for the proper proportionate intervals for the message to be correctly printed by the receiving instrument or recorder. The most successful apparatus of this kind is that devised by Wheatstone; others have been introduced by Siemens and Halske, Garnier, Humaston, Siemens, and Little.

In Wheatstone's automatic apparatus three levers are placed side by side, each acting a set of small punches and on mechanism for feeding the paper forward a step after each operation of the levers. The punches are arranged and the levers are adjusted so that the left-hand lever moves and punches a row of holes across the paper, three punches, the middle lever moves one punch only and punches a center hole while the right-hand lever moves four punches and punches four holes. The whole of this operation represents a dot and a dash or the letter "a." The side rows of holes only are used for transmitting the message; the center row being required for feeding forward the paper in the transmitter. The perforation of the paper when done by hand is usually performed by means of small mallets, but at the central telegraph office the keys are only used for opening air-valves, the actual punching being done by pneumatic pressure. In this way several thicknesses of paper can be perforated at the same time, which is a great convenience for press work, since copies of the same message have often to be transmitted to several newspapers at the same time. The mode of using the paper ribbon for the transmission of the message is illustrated in fig. 3. An ebonite beam E is rocked up and down rapidly by a train of mechanism, and moves the cranks A and B by means of two metal pins *p*, *p*. A and B are in metallic contact with each other through the springs *s*, *s*, and they carry two light vertical rods M, M_1, the one as much in front of the other as there is space between two successive holes in the perforated ribbon. To the other ends of A, B rods H, H_1 are loosely hinged, their ends passing loosely through holes in the ends of the bar P, which is fixed to the divided disk D. By means of two collars K, K_1 and the wheel W, the disk D is made to oscillate in unison with the beam E. The cranks C and C_1 are connected with the poles of the sending battery B. The operation is as follows: The paper ribbon R is moved forward by its center row of holes at the proper speed above the upper ends of the rods M, M_1; should there be no hole in the ribbon it pushes the crank A or B out of contact with the pins *p*, *p*, and prevents a current passing to the line. Should, however, a row of holes, like group 1 above, be perforated, the rod M_1 will first be allowed to pass through the paper, and copper will be put to the line; at the next half stroke of the beam, M will pass through, and, as the disk D reverses the battery, zinc will be put to the line. Thus, for a dot, first a positive and then a negative current are sent to the line, the effect of the positive current continuing during the time required for the paper to travel the space between two holes. Again, suppose groups 3 and 4 to be punched. The first part will be, as before, copper to the line; at the next half stroke of the beam, M will not pass through, as there is no hole in the paper; but at the third half stroke it passes through and zinc is put to the line. Thus, for a dash, the interval between the positive and the negative current is equal to the time the paper takes to travel over twice the space between two successive holes. Hence, for sending both a dot and a dash, reverse currents of short duration are sent through the line, but the interval between the reversal is three times as great for the dash as for the dot. In the receiving instrument, the electromagnet is so constructed that the armature, if pulled into any position by either current, remains in that position, whether the current continues to flow or not, until a reverse current is made to act on the magnet. For the dot the armature is deflected by the first current, the ink-wheel being brought into contact with the paper, and, after a short interval, pulled back by the reverse current. In the case of the dash, the ink-wheel is brought into contact with the paper by the first current as before, and is pulled back by the reverse current after three times the interval. The armature acts on an inking disk on the principle described above, save only that the disk is supplied with ink from a groove in the second wheel, on which it rolls; the grooved wheel is kept turning with one edge in contact with ink in an ink-well. By this method of transmission, the battery is always to the line for the same interval of time, and alternately with opposite poles, so that the effect of electrostatic induction is reduced to a minimum. Through the instrumentality of this method as many as 400 words per minute have lately been transmitted.

The first considerable improvement on the House type-printer, referred to above, was made by D. E. Hughes, of Kentucky, in 1855. In the Hughes instrument (see fig. 4) two trains of clockwork mechanism, one at each end of the line, are kept moving synchronously by powerful spring governors. Each instrument is provided with a key-board, resembling that of a small piano, the key levers of which communicate with a circular row, R, of vertical pins. A horizontal arm, A, fixed to a vertical shaft in gear with the mechanism sweeps over these pins at the rate of from one to two turns per second. When a key is depressed, slightly raising one of the pins, the battery is put to the line for a short time at that part of the revolution by means of a sledge, S, carried by the horizontal arm. The current thus sent to the line may be made either to act directly on the printing instrument or to close a local circuit by means of a relay. For simplicity we will suppose direct action. The current then passes through the coils of a powerful electromagnet, M, which relieves the printing mechanism. The electromagnet consists of two coils, each containing a soft iron core of the same length as the coil. These cores rest on the ends of the two arms of a powerful horseshoe permanent magnet, and thus become strongly polarized by induction. A soft iron armature is placed across the free ends of the soft iron cores, and is pulled by a strong spring, the tension of which is adjusted so as to be nearly equal to the magnetic attraction. The current is sent in the proper direction to diminish the power of the magnet and allow the spring to preponderate. A very powerful action is thus obtained by means of a very small current, the actual work being done by motive-power in the instrument itself. After the letter is printed the mechanism short-circuits the magnet and replaces the armature automatically. The printing action is as follows: The type-wheel, W, is carried round continuously by the clockwork, to which it is attached through a friction sleeve which allows it to be stopped, and pushed backward or forward without stopping the mechanism. Another shaft carrying three cams is arranged so as to be locked into gear with the wheelwork when the armature leaves the poles of the magnet. The cams then come into action in rotation; the first moves the adjustment lever, shown to the left of W in the figure, which pushes a wedge-shaped piece into the teeth of the type-wheel and adjusts it exactly to the proper position for printing; the second cam presses the paper against the type; the third moves forward the paper; a fourth cam replaces the armature of the magnet and relieves the cam shaft, leaving the instrument ready to receive another letter. The whole of this operation occupies only a small fraction of a second. By means of the adjustment lever or "corrector," *l*, every error in synchronism decidedly less than half the space from letter to letter is perfectly corrected each time an impression is made. Thus, during the time the receiving instrument at one station is in use, its type-wheel is kept in perfect agreement with the sending wheel at the other station; and, if the electric action keeps time, a wrong letter cannot be printed unless the rate of the clockwork is at fault by some such amount as 1 or 2 per cent. If the two wheels are allowed to run a long time without the electric maintenance of agreement, they will be found more or less at variance, as the pieces of clock work, however good, cannot be perfect. All that is necessary to bring them into agreement again is to strike several times the key corresponding to a prearranged adjustment signal—that corresponding to the dot type, for instance. The receiver knows (according to the regulated system of working) that it is adjustment, not message, that is being sent; and he turns his type-wheel by hand till it prints dots. He then signals back "O. K." (all correct!), and is ready to receive the message. If by any accident his type-wheel gets on a wrong letter in the course of a message, he disturbs the sender (who all the time sees the effect of his sending printed before his own eyes) by sending back a few currents on him; he receives dots by way of acknowledgment, and resets his type-wheel to print correctly. This system of telegraphic printing has a great advantage over the step-by-step system in using continuous instead of intermittent currents, and so avoiding the necessity for the rapidly acting electric escapement, which, however skillfully planned and executed, is always liable to failure when worked too rapidly. In Hughes' instrument almost perfect accuracy and certainty have been attained; and in actual practice it has proved to be decidedly superior to all previous type-printing telegraphs, not only in speed and accuracy, but in less liability to mechanical derangement from wear and tear, and from accident. It involves many novel features: the receiving electromagnet is of peculiar construction and remarkable efficiency; the transmitting apparatus has a contrivance to prevent unintentional repetitions of a letter through the operator holding his finger too long on a key; the type-wheel has a lock for each station, to be opened by its own key, one of the letter keys of any of the instruments in the circuit. This instrument was for some years extensively used in the United States, until superseded by G. M. Phelps' modification of it, known as the "American combination printing telegraph," because it embodied part of Hughes' and part of House's instruments. With this modified form somewhat greater speed was obtained, but it was found difficult to drive, requiring the use of steam or some such motive-power. In a subsequent modification introduced in 1875 an electromotor is applied to drive the printing mechanism. This allows a shorter train and stronger wheelwork to be used, secures more certain action, and involves less risk of derangement. Hughes' form was taken up by the French Government in 1860, and is still very largely in use in France.

Stock and private line telegraphs constitute an important class of instruments, of which Laws' "gold indicator," introduced in 1866, may be taken as the forerunner. A brief description of Calahan's stock telegraph, introduced in 1867, will give a general idea of the action of this class of instruments. The printing mechanism consists of two type-wheels, on the edge of one of which are the letters of the alphabet, and on the edge of the other the numerals from one to nine and fractions by eighths up to unity. The type-wheels are placed side by side, but can be turned independently of each other. Beneath them a platen is carried on one end of a lever, whose other end is attached to the armature of an electromagnet. Between the platen and the wheels a ribbon of paper broad enough to cover the edges of both wheels is passed. The instrument is worked by three lines of wires, one for driving each type-wheel and one for printing and feeding the paper forward. The movement of the type-wheel is accomplished by an escapement acted on by closing and opening the circuit of an electromagnet. For the convenience of the sender the transmitting instrument is made in the form of two dials, each resembling the dial of an A B C instrument, round the edge of one of which letters are printed, and round the other the numerals and fractions. Mechanism is provided for opening and closing the circuit, so that by turning a handle (fixed to an axis passing through the center of the dial) until an index attached to it points to the letter which is to be printed, the type-wheel of the receiving instrument is in the proper position to print that letter, and this is accomplished by depressing a key and closing the third circuit. The printing magnet then raises the platen and presses the paper against the type. Suppose Direct United States telegraph stock is to be reported and the price is 9⅜. The operator turns the index on the letter dial to D and presses the printing key; he next turns the index to period and again presses the printing key; he then turns in succession to U, to period, to S, to period, and prints these; then he turns the index on the figure dial to 9 and prints it, lastly to ⅜ and to period, and prints them. The quotation then reads on the paper ribbon D. U. S. 9⅜.

Various modifications of this instrument have since been introduced.

Cowper's writing telegraph is designed to record the message in written characters; its arrangement is as follows:—Two lines of wire are connected, one with each of two small resistance slides, which are placed in such a way that the sliders move in the same plane but in directions at right angles to each other. A pen placed at the point of intersection of the lines of motion of the two sliders is connected with them in such a way that, when it is moved, as in the act of writing, each slider takes up that component of the motion which is in the direction in which it is free to move. The sliders thus vary the resistance in the line circuits by an amount proportional to the motion of the pen, and when a battery is kept joined in the circuit the current varies in the same way. The current is passed through the coils of two electromagnets at the receiving end, each capable of giving motion to a pencil in one line, at right angles to the direction of motion of the other. When the pen at the sending end is moved, as in the act of writing a message the pencil at the receiving end moves in a corresponding manner on account of the variations of the current, and in this way it writes the message on a slip of paper moving beneath its point.

Duplex, Quadruplex, and Multiple Telegraphy.—Duplex telegraphy consists in the simultaneous transmission of two messages, one in each direction, over the same wire. The solution of this problem was attempted by Gintl of Vienna in 1853 and in the following year by Frischen and by Siemens and Halske. Within a few years several methods had been proposed by different inventors, but none were at first very successful, not from any fault in the principle, but because the effect of electrostatic capacity of the line was left out of account in the early arrangements. The first to introduce a really good practical system of duplex telegraphy, in which this difficulty was sufficiently overcome for land line purposes, was J. B. Stearns of Boston, Mass. In order that the line between two stations S_1 and S_2 may be worked on the duplex system it is essential that the receiving instrument at S_1 shall not be acted on by the currents sent into the line at S_1, and similarly that the currents sent into the line at S_2 shall not act on the receiving instrument at S_2, while at the same time these currents must act on the instruments at S_2 and S_1 respectively. The two methods most commonly employed are the following:

(1) In the first we have the sending battery, a resistance, equal to that of the battery, a set of resistance coils, and a condenser. Suppose the key at station S_1 to be depressed; then a current flows into the line through circuit 1, and to earth through circuit 2. Now, if both these currents pass round the electromagnet of the receiving instrument, but in opposite directions, and if their strengths are properly adjusted, no effect will be produced on that instrument. At station S_2, however, the current flows to earth, partly through circuit 1 and partly through circuit 2, but in the same direction round the coils of the receiving instrument. Hence, if the current is strong enough, the receiving instrument at S_2 will be set in action. Similarly the depression of the key at S_2 can be made to produce a signal at S_2 and yet have no effect on the instrument at S_2. The necessary and sufficient condition is that the currents in circuits 1 and 2 at the sending station shall at all times bear a certain fixed ratio to each other, depending on the coils of the receiving instrument at that station. If for simplicity we suppose the resistance of the line to be constant and not to be affected by the transmitting apparatus, and to be of zero electrostatic capacity, the fixed ratio may be obtained by adjusting the resistance coil in circuit 2. In actual practice the line has capacity, and this is compensated for by supplying to the coil from the condenser capacity equivalent to that of the line. The condenser should be of such a form that the capacity in the circuit can be varied, and it must have the same inductive retardation as the line; that is to say, the capacity must be distributed along the resistance coil in a manner equivalent to that in which the capacity of the line is distributed along its resistance. A rough approximation to this adjustment will answer the purpose for ordinary land line working, but for submarine cable work a very accurate adjustment is necessary. In order that the manipulation of the key may not affect the resistance of the line, the resistance between two given points should be as nearly as possible the same for all positions of the key. This implies that the keys shall not at any time break circuit, nor make contact on both the front and the back stops for more than an instant, for an instantaneous break of the circuit would affect the signals being received from the other station. The principle of the "continuity preserving key," used for duplex working, will be understood from the explanation. So long as the key is not depressed the line is kept to earth through the resistance; when the key is pushed down it suddenly changes to the battery being at the transition in contact with both battery and resistance. This produces very little disturbance, because the key is moving quickly at that part of its stroke, and the resistance of the line and receiving instrument is generally much higher than that of the initial resistance. This is called the "differential method." The principle was first enunciated by Frischen; but its present condition is the result of the labors of a large number of experimenters, among whom may be mentioned Siemens and Halske,

Stark, Edlund, Gintl, Nyström, Preece, Nedden, Farmer, Maron, Winter, Stearns, and Muirhead.

(2) The second method to which we may here refer is known as the "bridge method" from the similarity of the arrangement (see fig. 5) to that of the Wheatstone bridge. Instead of sending the currents in the two branches of the divided circuit DP and DQ through the two coils of a differentially wound relay or receiving instrument, as in Frischen's method, two resistances *a* and *b* are inserted and the instruments are joined between P and Q. It is clear that if the difference of potential between P and Q is unaffected by closing the sending key K no change of current will take place in the instrument circuit. The relative potential of P and Q is not affected by the manipulation of K if the resistance *a* is to that of *b* as the resistance of L is to that of R; hence that is the arrangement used. The same remarks with regard to retardation and capacity that were made when describing the differential method apply here also. One very great advantage in this method is that the instrument used between P and Q may be of any ordinary form.

Most important cables, such as those of the Eastern Telegraph Company and the various Atlantic cables, are worked duplex on Muirhead's plan.

Quadruplex telegraphy consists in the simultaneous transmission of two messages from each end of the line. The only new problem introduced is the simultaneous transmission of two messages in the same direction; this is sometimes called "diplex transmission." The solution of this problem was attempted by Dr. J. B. Stark of Vienna in 1855, and during the next ten years it was worked at by Bosscha, Kramer, Maron, Shaak, Schreder, Wartmann, and others. The first to attain success was Edison, and his method with some modifications is still used.

An ingenious and comparatively simple multiplex telegraph is the invention of Prof. Elisha Gray, of Chicago. In this apparatus advantage is taken of the sympathetic action of similar bodies in vibration. The strings of a piano will respond with a species of echo when another piano is played in the vicinity. Two turning forks will answer each other in a similar manner. In Gray's instrument a number of vibrating forks of different pitch are placed at either end of the line, and a similar set of receivers. When the line is at rest the current flows silently the length of the line, and does not affect any of the receiving instruments.

Each sending key is so arranged that it controls a portion of the battery. When a key is closed that portion of the battery controlled by that key is changed so that its current flows through an interrupter or vibrator, the vibrations being of a definite rate, and adjustible. At the opposite terminal of the line a similarly attuned receiver takes up the vibrations. A number of these pairs of receivers and senders are placed upon the line, and no receiver is disturbed by the sets of vibrations from any but its corresponding sender. The forks are carefully tuned, of course, and the Gray multiplex has successfully sent and received as many as eight messages at the same time over one wire, thus giving employment to sixteen persons at once.

Working of Submarine Cables.—The arrangement of the apparatus for working some of the most recent cables is shown in fig. 6. The cable is supposed to be worked duplex; but if S, C_1, C_2, and AC are removed and the key connected directly with C_3, the arrangement for simplex working is obtained. The apparatus consists of a sending battery B, a reversing transmitting key K, a slide of small resistance S, three condensers C_1, C_2, C_3, an artificial cable AC, the receiving instruments I and G, and one or more resistances R for adjusting the leakage current. The conductor of the cable is practically insulated, as the condensers in the bridge have a very high resistance; hence no appreciable current ever flows into or out of the line. Two receiving instruments, a siphon recorder and a mirror galvanometer, are shown; one only is absolutely necessary, but it is convenient to have the galvanometer ready, so that in case of accident to the recorder it may be at once switched into circuit by the switch *s*. When one of the levers of K is depressed, the condenser C_1 and the cable, and the condenser C_2 and the artificial cable, are simultaneously charged in series; but, if the capacity of C_1 bears the same proportion to the capacity of the cable as the capacity of C_2 bears to the capacity of the artificial cable, and if the other adjustments are properly made, no charge will be communicated to C_3. After a very short interval of time, the length of which depends on the inductive retardation of the cable, the condensers corresponding to C_1 and C_3 at the other end begin to be charged from the cable, and since the charge of C_3 passes through the receiving instrument I or G the signal is recorded. The charging of C_3 at the receiving end will take place, no matter what is the absolute potential of the condensers, consequently the incoming signals are not affected by those which are being transmitted from that end. In actual practice the receiving instrument is so sensitive that the difference of potential between the two coatings of the condenser C_3 produced by the incoming signal is only a very small fraction of the potential of the battery B. When the key is relieved the condensers and cables at once begin to return to zero potential, and if the key is depressed and relieved several times in rapid succession the cable is divided into sections of varying potential, which travel rapidly toward the receiving end, and indicate their arrival there by producing corresponding fluctuations in the charge of the condenser C_3. All cables of any great length are worked by reverse currents, the single needle alphabet being used; that is to say, currents in one direction indicate dots and in the other direction dashes.

The various lines of telegraph in the United States are practically under the control of one company—the Western Union—although its predominance has been threatened of late by a rival, the Postal system.

TELEMACHUS, son of Odysseus and Penelope, was an infant when his father left home to join in the war against Troy, but during the latter's long absence he grew into manhood. At the instigation of Athene, Telemachus set out in search of his long lost father, after having vainly endeavored to eject his mother's troublesome suitors from the house. Having visited Pylos and Sparta, he returned home to Ithica, where he found his father in the guise of a beggar, living with the swineherd Eumæus. After a mutual recognition father and son proceeded to slay the suitors. In modern times Telemachus is known chiefly as the hero of Fénelon's romance *Télémaque*, once very popular as a school book.

TELEMETER, or RANGEFINDER. This is an instrument used in modern warfare to determine the distance or range to an enemy's position, in order that correct elevations may be given to guns or rifles directed against it. Telemeters have been made on three distinct principles, and classified as acoustic, optical, and trigonometrical respectively.

Acoustic telemeters record the time which elapses between seeing the flash or smoke and hearing the report of a gun, rifle, or shell, the range being given in yards as "the time in seconds × 364.6." The Boulengé telemeter is the best known of this class. It consists of a graduated glass tube filled with liquid and containing a small metal traveler. At the flash the instrument is brought to a vertical position, and the traveler starts from zero; at the detonation it is turned to a horizontal position and the traveler stops. The objections to the acoustic telemeter are that the rate of transmission of sound in air is affected by wind and other local conditions and that the instrument cannot be used until firing has commenced.

Optical or *perspective telemeters* determine the distance to any point by observing the size of some object of known dimensions, as seen in a graduated telescope. Porro's telemeter, Elliott's telescope, and Nordenfelt's macrometer illustrate the principle. The chief defect of the system is that the objects most conveniently observed—men and horses—vary considerably in size, so that the assumption of a constant dimension may be productive of error.

Trigonometrical telemeters shorten the ordinary methods of surveying by adapting them to military purposes. They are of two kinds—field rangefinders and rangefinders for coast batteries.

Rangefinders for Coast Batteries.—Rangefinding is less adapted to the requirements of coast defense than "position finding,"—a method which furnishes every gun with its proper training and elevation so that it can be fired without sighting the target. Rangefinders are, however, sometimes employed. The most worthy of notice is the Watkin depression rangefinder. The range is found by observing the angle of depression to the object. This is done by a powerful cross-wire telescope, which forms part of the instrument. The fastest steamer can be continuously followed, and even the successive grazes of shot and shell can be observed. The instrument is leveled upon a tripod stand. When necessary, it finds its exact height in feet above the water-level in any state of tide by reference to a datum distance, and it records the range in yards automatically on a graduated cylinder. An interesting contrivance combining telemeter and gun-sight, applicable to guns in permanent emplacements over non-tidal waters, has been tried in Italy. By means of a cam the hind-sight of the gun is always maintained in the position necessary to give the proper elevation in firing, so that it only remains to make the sights cover the target.

TELEOLOGY, the doctrine of ends, is derived from the Greek word τελός, *telos*, an end. All the ancient systems of morality correctly regarded it as a practical science; they started with the inquiry: What is the proper and final end of all human conduct? and the answer given by each school was the characteristic doctrine of that school. Aristotle answered "Happiness, in a peculiar sense;" the Stoics said, "A regard to the whole universe of being;" the Epicureans, "Pleasure and the absence of pain." John Stuart Mill, in the concluding chapters of his Logic, entitled "The Logic of Practice or Art; Including Morality and Polity," adopts the ancient point of view, and observes that there should be a science of ends, or a reasoned statement of the final purpose of all human action; and for this science he suggests the name of Teleology, remarking that it corresponds to what the Germans call the practical reason. From that time the term has had the meaning indicated by Mill, and is looked upon as a distinct legitimate science.

TELEOSAURUS, a genus of fossil crocodiles, the remains of which occur in the Oölitic rocks. They are found associated with marine fossils and the peculiar modification of their skeletons seems to have specially fitted them for an aquatic life. No less than twenty species have been described, and these present so many striking differences that they have been arranged under six sub-genera.

TELEPHONE. Telephony is the art of reproducing sounds at a distance from their source. The term was first used by Philip Reis of Friedrichsdorf, in a lecture delivered before the Physical Society of Frankfort in 1861. But, although this lecture and Reis' subsequent work received considerable notice, little progress was made until the subject was taken up between 1874 and 1876 by Alexander Graham Bell, a native of Edinburgh, then resident in Boston, Mass. Bell, like Reis, employed electricity for the reproduction of sounds; but he attacked the problem in a totally different manner. This will be better understood if we consider shortly on what the chief characteristics of sound depend (compare ACOUSTICS).

The sensation of sound is produced by rapid fluctuations in the pressure of the atmosphere on the tympanum of the ear. If the fluctuations are irregular and non-periodic, the sound is called a noise; if they are cyclic and follow a regular and sufficiently rapid periodic law, the sound is musical. In connection with the present subject it is important to notice the three characteristics of a musical sound, namely, *pitch*, *loudness*, and *quality*. The pitch of a musical sound depends on the number of cycles passed through by the fluctuations of the pressure per unit of time; the loudness depends on the amount or the amplitude of the fluctuation in each cycle; the quality depends on the form or the nature of the fluctuation in each cycle. The necessary condition for a successful system of telephony is the ability to reproduce these characteristics.

In July, 1837, Dr. C. G. Page, of Salem, Mass., drew attention to the sound given out by an electromagnet at the instant when the electric circuit is closed or broken, and in October of the same year he discussed, in a short article entitled *Galvanic Music*, the musical note produced by rapidly revolving the armature of an electromagnet in front of the poles. Experiments bearing on this subject were subsequently made by a great number of investigators. Page's discovery is of considerable importance in connection with the theory of action of various forms of telephone, and was a very important feature in the early attempts by Reis to transmit music and speech. On August 26, 1854, there appeared in *L'Illustration* (Paris) an interesting article by Charles Bourseul, on the electric transmission of speech. The writer recommended the use of a flexible plate at the source of sound, which would vibrate in response to the varying pressure of the air, and thus open and close an electric circuit, and of a similar plate at the receiving station, which would be acted on electromagnetically and thus give out as many pulsations as there are breaks in the current. These suggestions were to some extent an anticipation of the work of Reis; but the conditions to be fulfilled before the sounds given out at the receiving station can be similar in pitch, quality, and relative intensity to those produced at the transmitting station are not stated, and do not seem to have been appreciated.

In Reis' lecture an apparatus was described which has given rise to much discussion as to priority in the invention of the telephone. The instrument was described in over fifty publications in various countries, and was well known to physicists previous to Bell's introduction of the electric telephone as a competitor with the electric telegraph. Reis caused a membrane to open and close an electric circuit at each vibration, thus transmitting as many electric pulses through the circuit as there were vibrations in the sound. These electric pulses were made to act on an electromagnet at the receiving station, which in accordance with Page's discovery, gave out a sound of a pitch corresponding to the number of times it was magnetized or demagnetized per second.

The next worker at the telephone, and the one to whom the present great commercial importance of the instrument is due, was Bell. His aim was the production, by means of the undulations of pressure on a membrane caused by sound, of an electric current the strength of which should at every instant vary directly as the pressure varied. His first idea seems to have been to employ the vibrations of the current in an electric circuit, produced by moving the armature of an electromagnet included in the circuit nearer to or farther from the poles of the magnet. He proposed to make the armature partake of the vibrations of the atmosphere either by converting it into a suitable vibrator or by controlling its vibrations by a stretched membrane of parchment. In the early trials the armature had the form of a hinged lever of iron carrying a stud at one end, which pressed against the center of a stretched membrane. The experiments with this form were not successful, and, with the view of making the moving parts as light as possible, he substituted for the comparatively heavy lever armature a small piece of clock spring, about the size of a sixpence, glued to the center of the diaphragm. The magnet was mounted with its end carrying the coil opposite, and very close to the center of the piece of clock spring. This answered sufficiently well to prove the feasibility of the plan, and subsequent experiments were directed to the discovery of the best form and arrangement of the parts. An increase in the size of the iron disk attached to the membrane augmented both the loudness and the distinctness of the sounds, and this finally led to the adoption of the thin iron disk now in use, which is supported round its edge, and acts as both membrane and armature. Again, the form of the opening or mouthpiece in front of the membrane exercised considerable influence on the efficiency of the instrument, and it was ultimately ascertained that a small central opening, with a thin air space extending across the face of the membrane, was best. It was also found that comparatively small magnets were sufficient, and that there was no particular virtue in the closed circuit and electromagnet, but that a small permanent magnet having one pole in contact with the end of the core of a short electromagnet, the coil of which was in circuit with the line, but which had no permanent current flowing through it, answered the purpose quite as well. In fact the effect of keeping a permanent current flowing through the line and the coils of the electromagnet was to keep the core of the electromagnet magnetized. This seems to have been almost simultaneously pointed out by Bell and others who were working in conjunction with him and by Professor Dolbear. Many experiments were made for ascertaining the best length of wire to use in the coil of the transmitting and the receiving instrument; but this is clearly a question dependent to a large extent on the nature of the line and the system of working adopted.

After Bell's success a large number of experimenters entered the field, and an almost endless variety of modifications have been described. But few possess any real merit, and almost none have any essentially new principle.

A telephone transmitter and a receiver on a novel plan were patented in July, 1877, by Edison, shortly after the introduction of Bell's instruments. The receiver was based on the change of friction produced by the passage of an electric current through the point of contact of certain substances in relative motion. In one form a drum, mounted on an axis and covered by a band of paper soaked in a solution of caustic potash, is turned under a spring, the end of which is in contact through a platinum point with the paper. The spring is attached to the center of a diaphragm in such a way that, when the drum is turned, the friction between the point of the spring and the paper deflects the diaphragm. The current from the line is made to pass through the spring and paper to the cylinder. Now it had been previously shown by Edison that, when a current is made to pass through an arrangement like that just described, the friction between the paper and the spring is greatly diminished. Hence, when the undulating telephonic currents are made to pass through the apparatus, the constant variation of the friction of the spring causes the deflections of the diaphragm to vary in unison with the variation of the electric currents, and sounds are given out corresponding in pitch, and also to some extent in quality, with the sounds produced at the transmitting station. A cylinder of chalk was used in some of Edison's later experiments with this receiver.

Experiments very similar to these of Edison were made by Elisha Gray, of Boston, Mass., and described by him in papers communicated to the American Electrical Society in 1875 and 1878. In these experiments the electric current passed through the fingers of the operator's hand, which thus took the place of the spring in Edison's apparatus. The diaphragm was itself used as the rubbing surface, and it was either mounted and rotated or the fingers were moved over it. When the current passed, the friction was felt to increase, and the effect of sending a rapidly undulating current through the arrangement was to produce a sound. The application of this apparatus to the transmission of music is described by Gray.

In another form of telephone, brought prominently forward by Professor Dolbear, the effects are produced by electrostatic instead of electromagnetic forces, as in the Bell telephone. Sir W. Thomson observed in 1863 that when a condenser is charged or discharged a sharp click is heard, and a similar observation was made by Cromwell F. Varley, who proposed to make use of it in a telegraphic receiving instrument. In Dolbear's instrument one plate of a condenser is a flexible diaphragm, connected with the telephone line in such a way that the varying electric potential produced by the action of the transmitting telephone causes an increased or diminished charge in the condenser. This alteration of charge causes a corresponding change in the mutual attraction of the plates of the condenser; hence the flexible plate is made to copy the vibrations of the diaphragm of the transmitter. It is obvious that this apparatus may be used either as a transmitter or as a receiver, but that the effects must under ordinary circumstances be in either case extremely feeble.

It was very early recognized—and, indeed, is mentioned in the first patents of Bell, and in a caveat filed by Elisha Gray in the United States patent office only some two hours after Bell's application for a patent—that sounds and spoken words might be transmitted to a distance by causing the vibrations of a diaphragm to vary the resistance in the circuit. Both Bell and Gray proposed to do this by introducing a column of liquid into the circuit, the length or the resistance of which could be varied by causing the vibrations of the diaphragm to vary the depth of immersion of a light rod fixed to it and dipping into the liquid. This idea has been perhaps the most fruitful of any modification of telephonic apparatus introduced.

On April 4, 1877, Mr. Emile Berliner filed a caveat in the United States patent office, in which he stated that, on the principle of the variation with pressure of the resistance at the contact of two conductors, he had made an instrument which could be used as a telephone transmitter, and that, in consequence of the mutual forces between the two parts of the current on the two sides of the point of contact, the instrument was capable of acting as a receiver. The caveat was illustrated by a sketch showing a diaphragm with a metal patch in the center, against which a metal knob was lightly pressed by an adjusting screw. This seems to have been the first transmitter in which it was proposed to use the resistance at the contact of two conductors.

Almost simultaneously with Berliner, Edison conceived the idea of using a variable resistance transmitter. He proposed to introduce into the circuit a cell containing carbon powder, the pressure on which could be varied by the vibrations of a diaphragm. He sometimes held the carbon powder against the diaphragm in a small shallow cell (from a quarter to half an inch in diameter and about an eighth of an inch deep), and sometimes he used what he describes as a *fluff*, that is, a little brush of silk fiber with plumbago rubbed into it. In another form the plumbago powder was worked into a button cemented together with syrup and other substances. In the specification of the patent applied for on July 21, 1877, he showed a sketch of an instrument which consisted of a diaphragm, with a small platinum patch in the center for an electrode, against which a hard point, made of plumbago powder cemented together with india-rubber and vulcanized, was pressed by a long spring, the pressure of the carbon against the platinum disk being adjusted by a straining screw near the base of the spring. Subsequently he filed an application for a patent in which various forms of springs and weights assisted in maintaining the contacts and otherwise improved the instrument.

In the early part of 1878 Professor Hughes, while engaged in experiments upon a Bell telephone in an electric circuit, discovered that a peculiar noise was produced whenever two hard electrodes, such as two wires, were drawn across each other, or were made to touch each other with a variable degree of firmness. Acting upon this discovery, he constructed an instrument which he called a microphone, and which consisted essentially of two hard carbon electrodes placed in contact, with a current passing through the point of contact and a telephone included in the same circuit. One of the electrodes was attached to a sounding board capable of being vibrated by sound-waves, and the other was held either by springs or weights in delicate contact with it. When the sounding board was spoken to or subjected to sound-waves, the mechanical resistance of the loose electrode, due to its weight, or the spring, or both, served to vary the pressure at the contact, and this gave to the current a *form* corresponding to the sound-waves, and it was therefore capable of being used as a speaking-telephone transmitter. The best transmitters now in use are modifications of Hughes' apparatus. A microphonic apparatus very similar to it is described in the specification of a German patent taken out by Robert Lutdge on January 12, 1878. In this patent the action of the microphone is also described.

The next transmitter of note, introduced by Mr. Francis Blake, although it does not, like the first microphones, embody anything intrinsically new, is one of the most perfect and convenient forms of microphone. It is at present almost universally used in the United States.

It appears to be pretty well established that carbon in one form or another is the best material for one or both of the contacts of a microphone transmitter. When both the contacts are of carbon and the surfaces have considerable area, say from a quarter to half an inch in diameter, the sounds are loud, but have a tendency to harshness. When, as in the Blake transmitter, one of the contacts is a piece of polished gas carbon and the other a small sphere of platinum about the twentieth of an inch in diameter, the articulation is clear, but less loud. For most purposes, however, the increased clearness more than compensates for the diminished loudness. Many transmitters in actual use have a number of contacts. Some of these when properly adjusted are both loud and clear in their action. Although the Blake instrument is most in vogue in America, in the United Kingdom and on the Continent multiple contact microphones have found more favor. Carbon powder instruments have been to some extent used, and in one or two cases—as, for example, the Hunnings transmitter—with considerable success.

Telephone Statistics.—The following are the latest statistics made public by the American Bell Telephone Company, which practically monopolizes the telephone business in the United States:

	1888.	1889.
Exchanges	739	742
Branch offices	452	452
Miles of wire on poles	127,839	142,631
Miles of wire on buildings	10,225	10,266
Miles of wire under ground	8,009	17,038
Miles of wire submarine	365	536
Total miles of wire	146,438	170,471
Total circuits	132,004	143,687
Total employes	6,183	6,310
Total Subscribers	158,712	171,454

The number of instruments in the hands of licensees under rental at the beginning of 1889 was 411,511. The number of exchange connections daily in the United States is 1,051,566, or a yearly total of 383,821,590. The average number of daily calls per subscriber is 6.13. In 1888 the company received in rental of telephones $2,453,279, and paid its stockholders in dividends the same year $1,789,878. The Bell company and its subsidiary companies represent about $80,000,000 of capital; the Long Distance Telephone Company about $5,000,000.

The radiophone is an instrument proposed by A. G. Bell and Sumner Tainter in 1880 for utilizing radiant energy, such as light or radiant heat, for the transmission of sound. The apparatus forms a telephone transmitter of a particularly interesting kind. In the earlier papers describing it and the experiments which led to its invention it is called *photophone*, because at that time the effects were supposed to be wholly due to light. Afterwards, in order to avoid ambiguity, Bell changed the name to *radiophone* and suggested that, to distinguish between instruments depending on the different kinds of radiation, the names *photophone*, *thermophone*, *etc.*, should be employed. He also proposed the name *spectrophone* for an application of this instrument to spectrum investigation. The apparatus is founded on the discovery, made by Mr. May while carrying out experiments on selenium for Mr. Willoughby Smith, that when selenium is exposed to light its electrical resistance is very different from what it is in the dark. This discovery led to a great many interesting experiments by other investigators. In thinking over this discovery in 1878 Bell conceived the idea that, if a beam of light proceeding from one station could be made to fall on a selenium plate at another station, and if its intensity could be varied by the voice of a speaker, then by connecting a telephone and a battery in circuit with the selenium plate the words spoken at the distant station would be heard in the telephone. This was found to be the case. At first, to vary the intensity of the beam, it was passed through a small opening, the width of which could be varied by the vibrations of a diaphragm against which the speech was directed. But better results were afterward obtained when the diaphragm formed a mirror from which the beam of light was reflected. The spreading of the beam, due to the vibrations of the mirror diaphragm, served to vary its intensity.

Edison's phonograph is an instrument whose action somewhat resembles that of a telephone transmitter and which has been much talked of in regard to its possible applications in telephony. It was invented shortly after the introduction of the telephone for the purpose of recording sounds, and was included in some of Edison's telephone patents as a means of working a telephone transmitter, and thus telephoning sounds which had been previously recorded on the phonograph sheets.

One of the best-known forms of the Reis telephone is shown in fig. 1. The transmitter consists of a box A, provided with a mouthpiece M. In the top of the box a round hole is cut and across it a membrane S of hog's bladder is stretched. A thin strip of platinum *p* fixed to the box at one side of the hole and extending to the center of the membrane, supports at that point one foot of a light metal tripod *egf*. One of the feet, *e* or *f*, rests in a cup containing mercury, which is in metallic connection with the terminal *b*, while the end of the strip *p* is similarly in connection with the terminal *a*. The receiver consists of an electromagnet made up of a magnetizing coil H, with a stout knitting needle for a core. When in use these two instruments are joined in circuit with a battery B, so that under ordinary circumstances a continuous current is flowing through the line. Suppose a sound is then produced in front of the mouthpiece M, the successive variations in the pressure of the air are communicated to the inside of the box, and cause the membrane to vibrate in unison with the sound. Reis' theory of the action of the instrument was that at each outward impulse of the membrane the point *g* would be thrown out of contact with the plate underneath it and would thus break the circuit. There would consequently result as many breaks in the circuit as there were vibrations in the sound, and, in conformity with Page's discovery, the electromagnetic receiver would give out a rapid succession of beats, which would together form a continuous sound of the same pitch as that to which the transmitter was subjected.

The form of telephone now almost universally in use is shown in fig. 2. It was introduced in December, 1877, and consists of a compound permanent magnet M fitted into the center of a tube of vulcanite or "hard rubber" and carrying at one end a short electromagnet, the coil of which through its terminals *t*, *t* is included in the circuit when the instrument is in use. In front of the electromagnet, with its plane normal to the axis of the magnet, is fixed a thin soft iron disk about one and three-fourths inches in diameter, which has its cover cut to a convenient shape to form a mouthpiece. This telephone acts well either as a transmitter or as a receiver; but for the former purpose it is now seldom used on account of the great advances which have been made in "microphone" transmitters.

The first successful microphone transmitter was Edison's. An early form of it (fig. 3) somewhat resembles Bell's hand telephone in external form. A cell of insulating material has at its bottom a flat-headed platinum screw G; on the top of G is a layer of carbon powder C, on the top of that a thin platinum disk D, and above that, forming the cover of the cell, a disk of ivory B, held in position by a ring E. Resting on the center of this disk is a small piece of rubber tubing, which is lightly pressed by the diaphragm A, and this, as in the hand telephone, is held in position by the mouthpiece M. The varying pressure on A, when a sound is produced near it, causes corresponding variations in the pressure on the carbon powder, and this produces similar variations in its electrical resistance. Thus, when the instrument is included in an electric circuit through which a current is flowing, undulations in the pressure on the diaphragm produce corresponding undulations in the current.

The Blake transmitter, which is perhaps most widely used of all, is a simple modification of the Hughes instrument last described. It consists (fig. 4) of a frame F, to which is attached a diaphragm D of thin sheet iron; in front of this is a cover M, M provided with a suitable cavity for directing the sound-waves against the diaphragm. The microphonic arrangement consists of a spring S, about the hundredth of an inch thick and the eighth of an inch broad, fixed at one end to a lever L, and carrying at its free extremity a brass block W. In one side of W a small disk C of gas carbon is inserted, resting on the hemispherical end of a small platinum pin K, about the twentieth of an inch in diameter, held in position by a thin spring A. The pressure of the carbon on the platinum point can be adjusted by the screw N, which turns the lever about the flexible joint G. The electrical connections of the instrument as arranged for actual use are also illustrated in the figure. The current circuit goes through S, W, C, K, A, and the primary circuit of the induction coil I to the battery B, and thence to S again. This forms a local circuit at the transmitting station. The line of circuit passes through the secondary of the induction coil I to the line, from that to the telephone T at the receiving station, and then either to earth or back to the induction coil by a return line of wire.

In a large town it is neither practicable nor desirable to connect each subscriber directly with all the other subscribers, hence a system of "exchanges" has been adopted. An exchange is a central station to which wires are brought from the different subscribers, any two of whom can be put in telephonic communication with each other when the proper pairs of wires are joined together in the exchange. The arrangement is illustrated in fig. 5, where C represents an exchange from which wires radiate to the points *a*, *b*, *c*, *d*, . . . Suppose *a* wishes to speak to *d*; he communicates his wish to an attendant at C, who first calls *d*, and then connects 6 to 1, making the circuit continuous from *a* to *d*. The arrangements at the exchange for facilitating connections vary considerably, but are similar in principle to the switch boards used in telegraphy. Each of the wires is first brought to an indicator and then to a set of terminals arranged in an orderly manner on a board, the number of the terminal for any one wire being the same as the number under the shutter of the indicator in that wire circuit. In many cases the terminals take the form of spring clips, which connect the line to earth, and under which a thin piece of metal covered with insulating material on one side and called a "jack," can be readily inserted for connecting that circuit with any other. A piece of flexible wire cord, carrying a jack at each end, forms a ready and common medium of connection; but in many cases the switch board is arranged with cross strips of metal so that by inserting a jack into the terminals of the two wires they can be both connected to the same strip of metal and therefore together. In large exchanges one switch board of moderate size is not sufficient, and so a number are fitted, being connected together by several conductors, in order that no interruption may ensue in consequence of these being all occupied. A line on one board is connected with one on another board by joining the terminal of the first to one of the conductors connecting the two boards by a jack-cord, and then by another jack-cord connecting that conductor to the terminal of the other line. Thus different switch boards may be looked upon as separate exchanges, connected together by a number of trunk wires after the manner described below.

In a large system it is much more convenient and economical to have exchanges in the various districts, and connect these with a central exchange by a sufficient number of trunk lines. A subscriber in one district wishing to speak to a subscriber in another calls the exchange in his own district and is put in communication by the attendant stationed there with the central exchange. The attendant at the central exchange puts the subscriber in communication with the district he requires, and the attendant there calls the other subscriber and joins the two subscribers' lines together. In some cases neighboring district exchanges have, besides a common means of communication through the central exchange. an independent connection. These arrangements are diagrammatically illustrated in fig. 6, where 1, 2, 3, 4, 5, 6 represent district exchanges and C the central exchange; districts 3 and 4 and 4 and 5 are supposed to have independent connections.

The indicator, or annunciator as it is sometimes called, is shown in fig. 7. It consists of an electromagnet M, which, on a current being sent through it, pulls down the armature *a*, relieves the catch *c*, and allows the shutter *d* to fall down, exposing a plate *p*, on the front of which the number of the subscriber is printed. When the exchange is called, the shutter *d* is dropped, the attendant connects the line leading to the exchange table with the terminal corresponding to the indicator, and finds who is wanted; then he calls that subscriber, makes the through connection, and puts up the shutter. When the subscribers have finished, both call the exchange or, as it is commonly put, "ring off;" this drops both shutters and serves as the signal that they have finished speaking.

The principle of transmitting sound by the radiophone will be understood from fig. 8. M represents a mirror, from which a beam of light is reflected through the lens *l* to a second mirror *m*, and *m* forms a diaphragm against the back of which the sound vibrations sent through the tube *t* are made to impinge. The beam of light, after being reflected from *m*, passes through the lower lens *l*, and thence as a nearly parallel beam to the parabolic reflector R. A photophonic receiver P, supposed in this case to be a spiral of selenium wire wound on the surface of a cylinder, is placed at the focus of the reflector so that the beam of light from *m* is concentrated on it. In circuit with the receiver P a battery B and a telephone T are included and through the circuit a feeble electric current flows continuously. The photophonic receiver should be placed so as to receive as little light as possible from any other source than the mirror *m*. Words spoken through the tube *t* make the mirror *m* vibrate, so that the beam of light reflected from it becomes more or less spread. The lens *l* is then unable to bring the beam into parallelism, and the intensity of the reflections from R to P is varied, therefore also the current through the coil of the telephone, which in consequence gives out a sound. The amount of spreading of the beam being proportional to the intensity of the vibrations of *m*, and this again proportional to the intensity of the sounds, the sounds heard in the telephone are similar to those produced at the end of *t*. Theoretically the receiver may be at any distance from the transmitter, but considerable difficulty arises if the distance is great.

One of the simplest forms of the phonograph is shown in fig. 9. It consists of a rigid spindle S screwed for about one-third of its length and fitted to work smoothly but tightly in the frame *f*, *f*, which is securely attached to a sole plate P. On the spindle a drum D is fixed, the axis of which coincides accurately with that of the spindle. On the surface of the drum a screw is cut of precisely the same pitch as that on the spindle. A flywheel W is fixed to one end of the spindle, and is provided with a handle H, by which the spindle and drum can be conveniently turned. One of the bearings has either a screw thread cut along it, or is fitted with one or more studs which work easily, but without shake, in the screw thread. When the spindle is turned it receives a transverse motion, and a point fixed relatively to the sole plate P and touching the drum traces out a spiral on its surface, exactly coinciding with the screw-thread cut on it. A mouthpiece M, like that of a telephone transmitter, provided with a diaphragm of parchment or similar substance, is mounted on a lever, which is pivoted at *h* and provided with a set screw *b*. A blunt needle point is either fixed to the center of the diaphragm or carried by a light spring in such a way as to press on the center of the diaphragm with the needle point projecting outward. To use the instrument, the drum D is covered with a sheet of wax or tinfoil; and the mouthpiece is adjusted as shown in the figure, with the needle point over the hollow part of the tinfoil, and fixed by the set screw to make a slight indentation in it. The drum is then turned and words spoken in a somewhat loud and clear tone in front of the mouthpiece. The vibrations of the diaphragm cause the needle point to make indentations more or less deep, according to the intensity of the sound, in the surface of the wax or tinfoil. If the mouthpiece is then raised, the drum turned back to its original position, the mouthpiece lowered so that the point rests on the groove which it previously made, and the drum again turned, the diaphragm, acted on by the needle point passing over the indentation, will give out the same words which were spoken to it.

TELESCOPE. The telescope is an optical instrument employed to view or discover distant objects.

The credit of the discovery of the telescope has been a fruitful subject of discussion.

That Roger Bacon had tolerably clear ideas as to the practical possibility of constructing telescopes, and that Leonard Digges had access to some unpublished MSS. of Bacon, and by their aid constructed some form of telescope, seem to be obvious inferences from existing evidence. But it is quite certain that previous to 1600 the telescope was unknown, except possibly to individuals who failed to see its practical importance, and who confined its use to "curious practices" or to demonstrations of "natural magic." The practical discovery of the instrument was certainly made in Holland about 1608, but the credit of the original invention has been claimed on behalf of three individuals, Hans Lippershey and Zacharias Jansen, spectacle-makers in Middleburg, and James Metius of Alkmaar (brother of Adrian Metius the mathematician).

Telescopes seem to have been made in Holland in considerable numbers soon after the date of their invention, and rapidly found their way over Europe. Sirturus, in his *De Telescopio* (1618), states that "a Frenchman proceeded to Milan in the month of May, 1609, and offered a telescope for sale to Count di Fuentes;" and Lorenzi Pigorna writes, under date of August 31, 1609, that "Galileo had been appointed lecturer at Padua for life on account of a perspective like the one which was sent from Flanders to Cardinal Borghese." Simon Marius, the German astronomer, appears to have made astronomical observations in 1609 with a telescope which he procured from Holland, and Professor Rigaud of Oxford found from the MSS. of Harriot, the mathematician, that he had been making astronomical observations with a Dutch telescope as

TELESCOPES

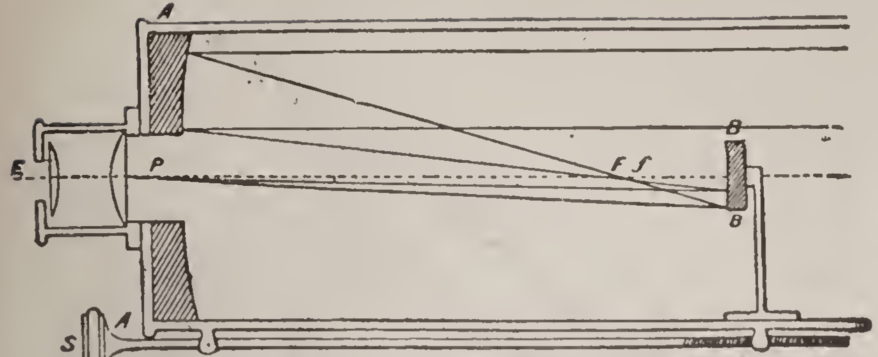


Fig. 3.—Gregorian telescope.

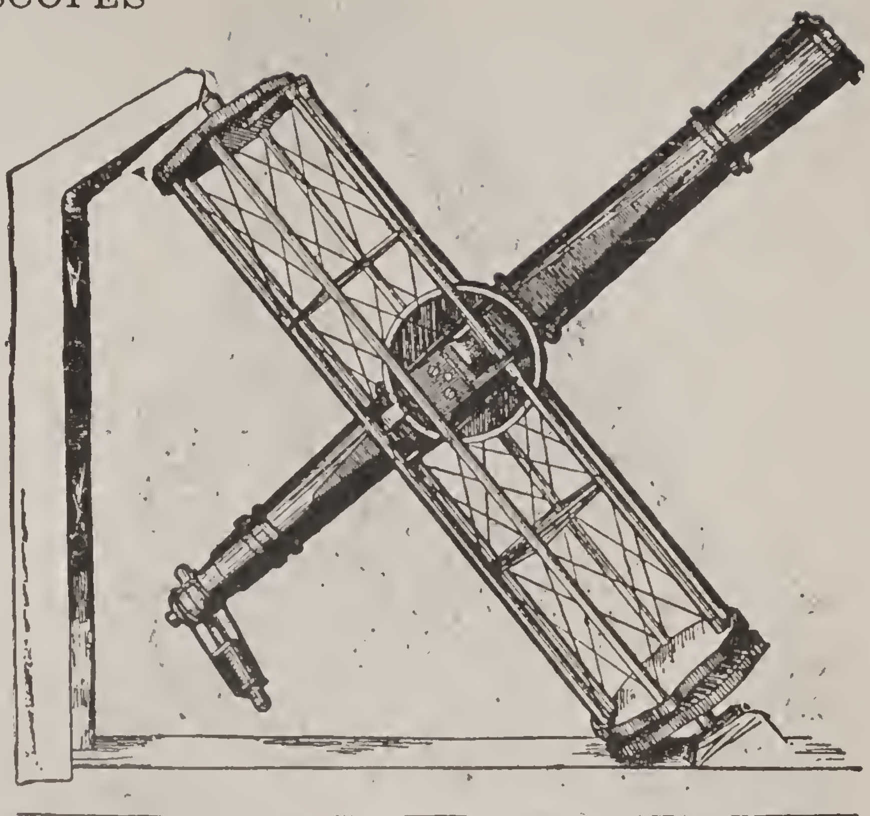


Fig. 8.—Grubb's telescope for Greenwich.

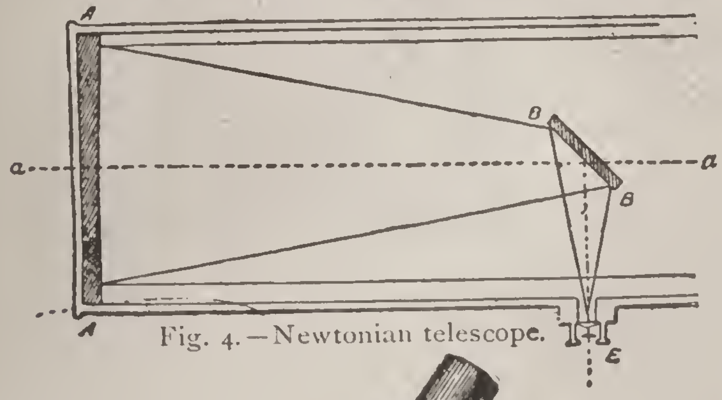


Fig. 4.—Newtonian telescope.

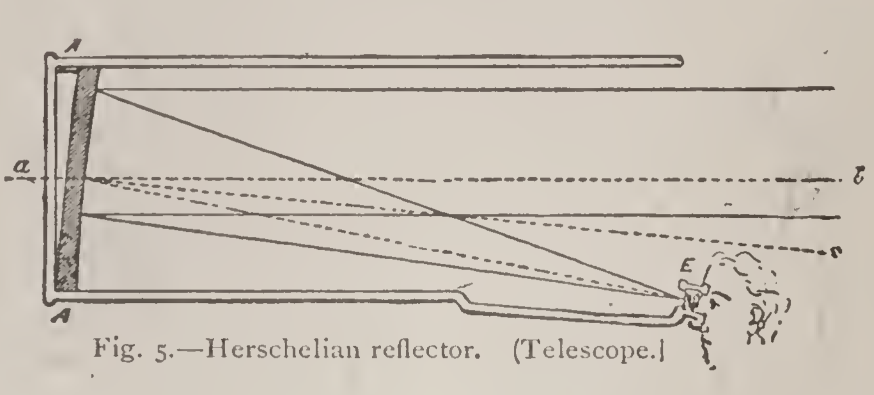


Fig. 5.—Herschelian reflector. (Telescope.)

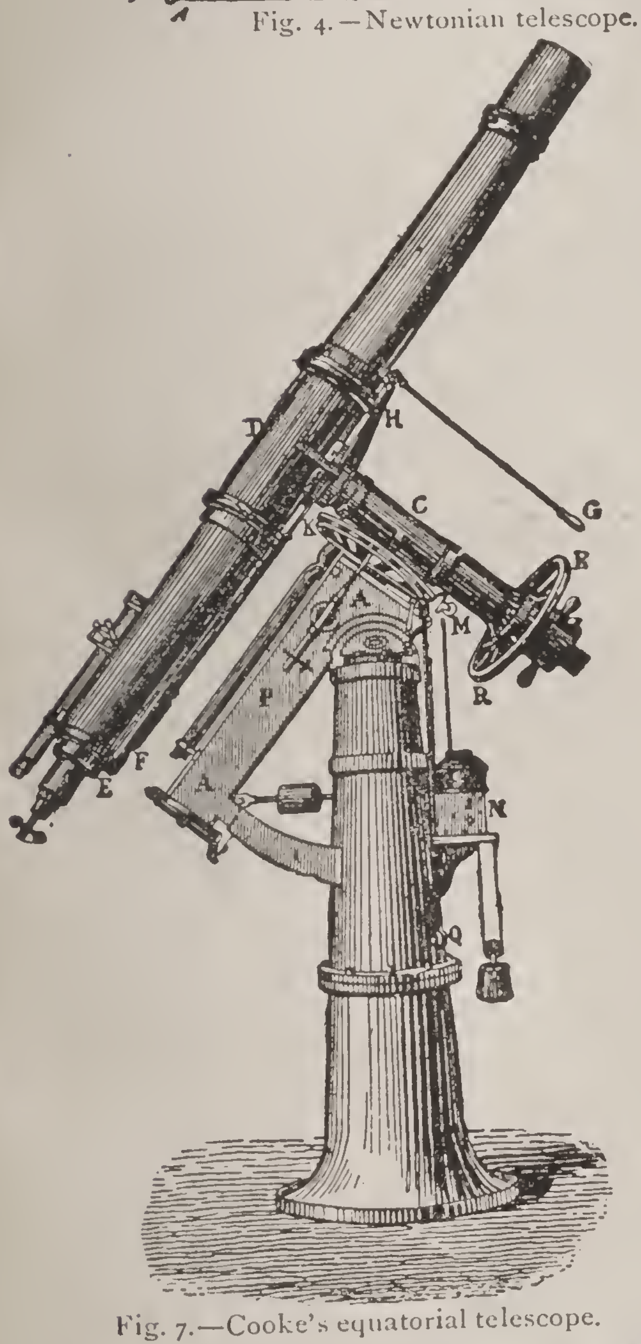


Fig. 7.—Cooke's equatorial telescope.

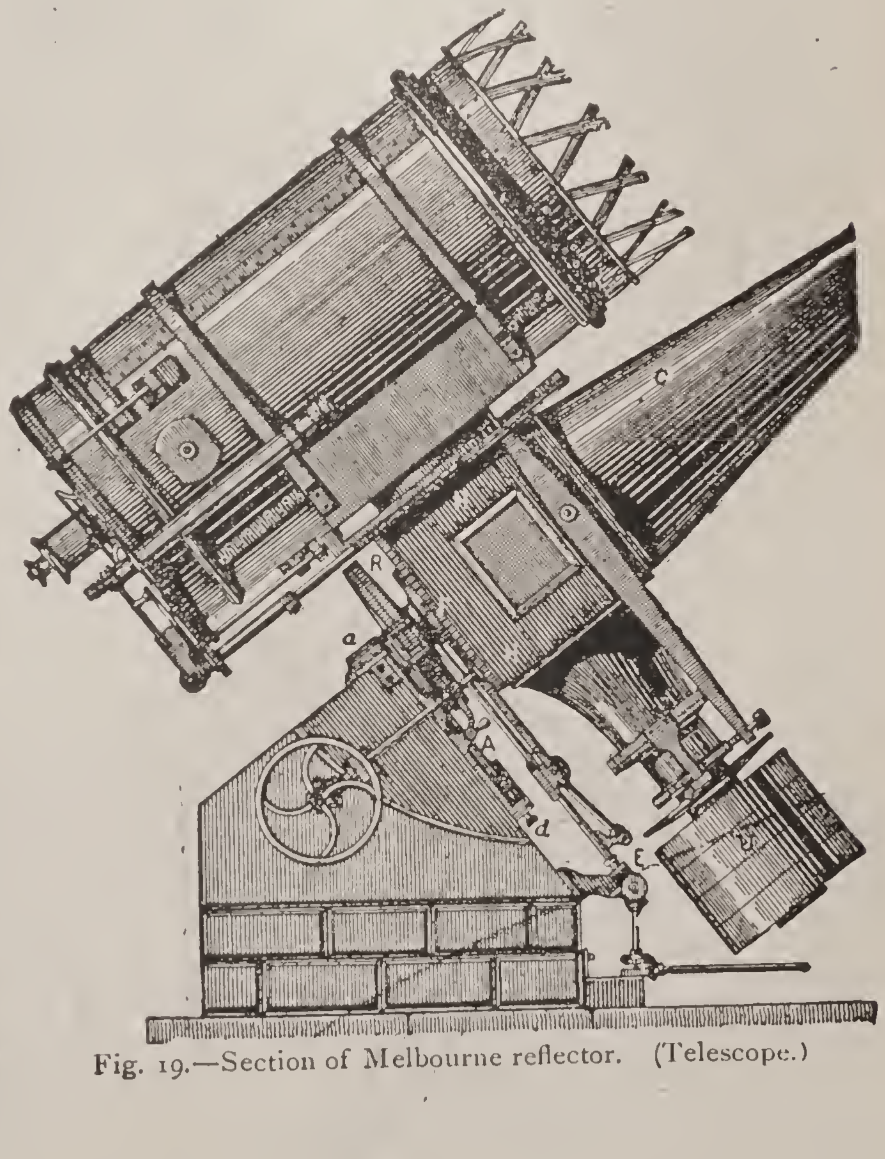


Fig. 19.—Section of Melbourne reflector. (Telescope.)

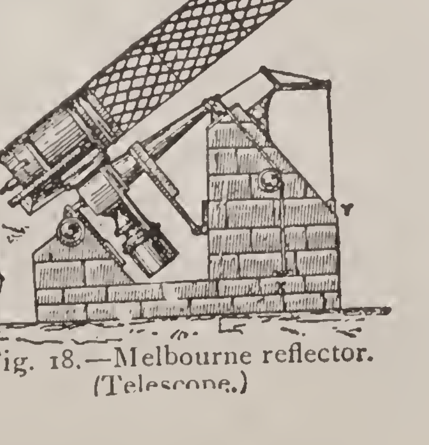


Fig. 18.—Melbourne reflector. (Telescope.)

TELESCOPES.

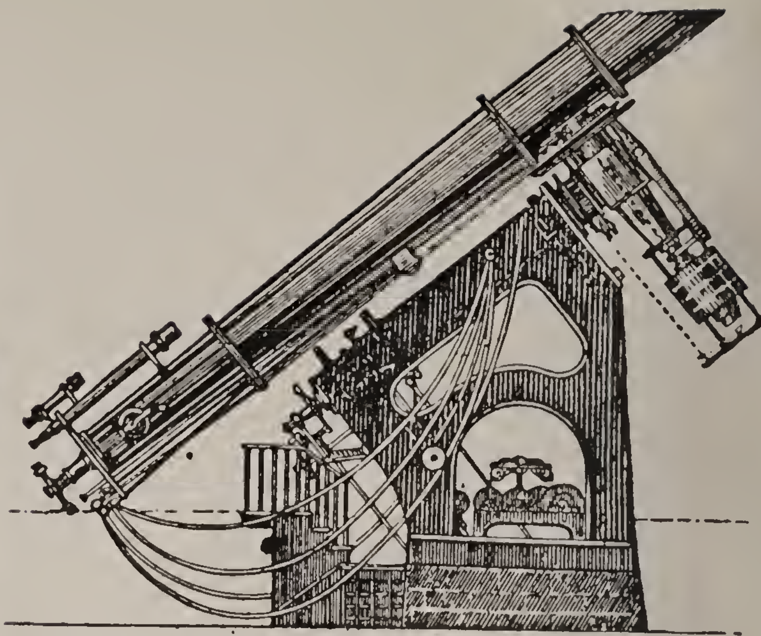


Fig. 14.—Grubb's mounting for the Lick object glass. (Telescope.)

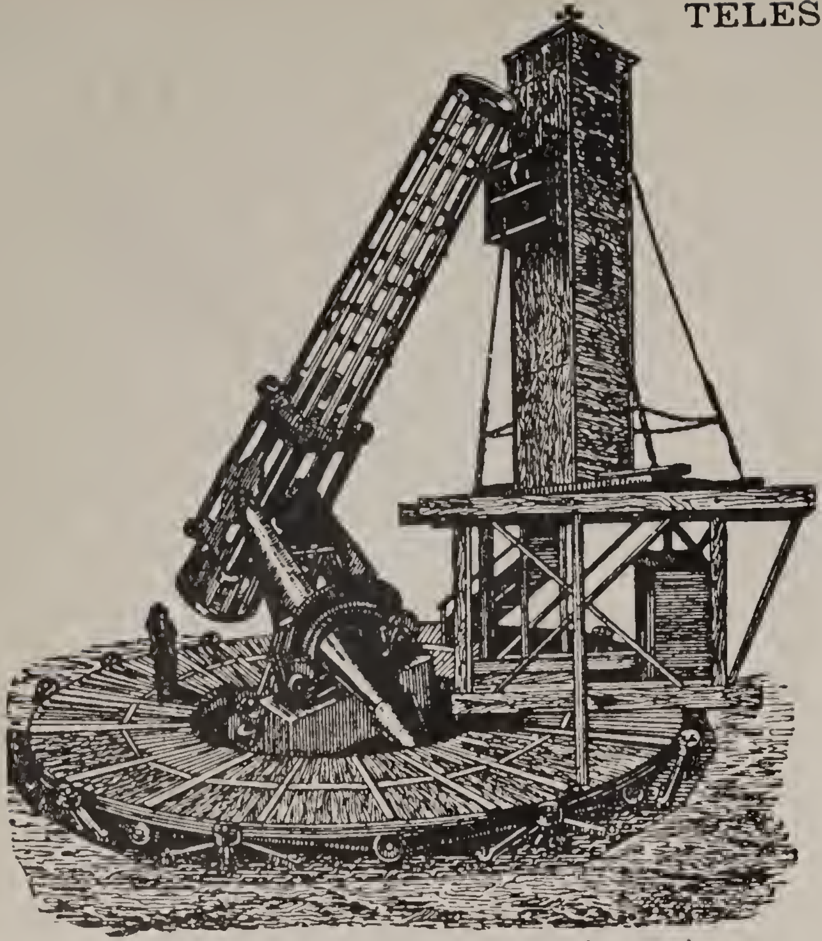


Fig. 15.—Lassell's reflector. (Telescope.)

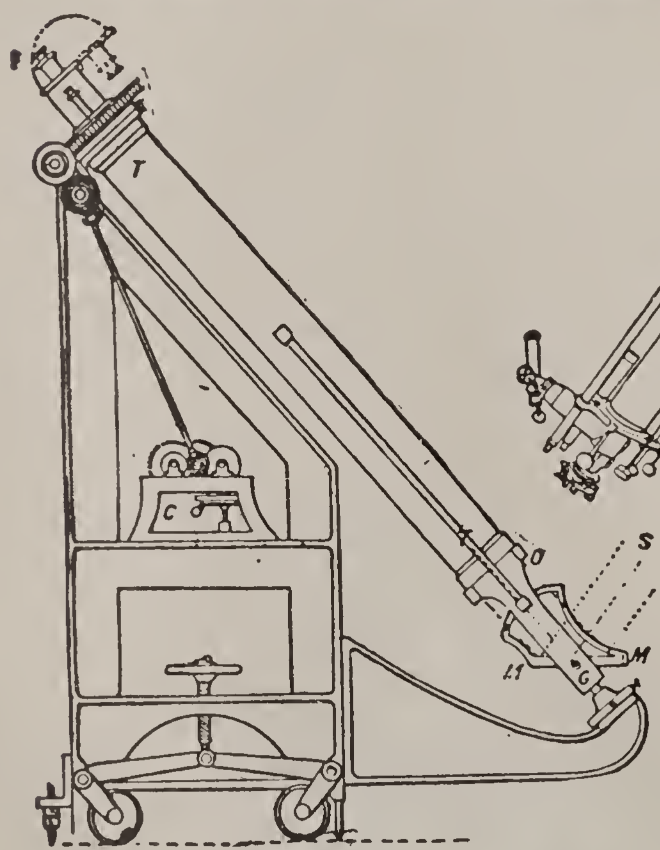


Fig. 17.—Grubb's siderostatic telescope.

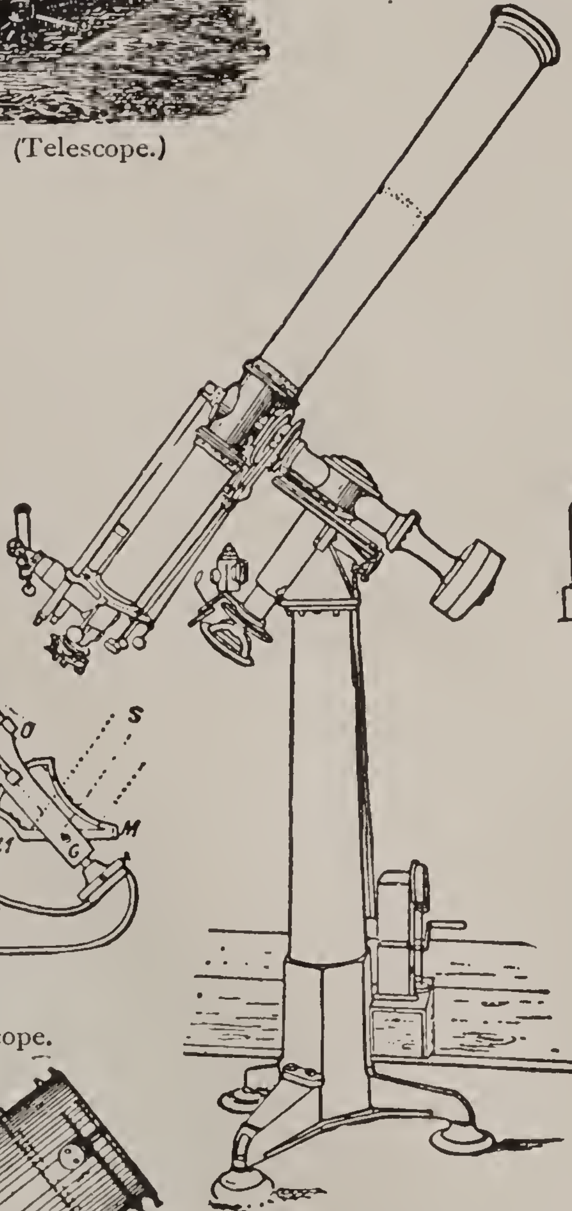


Fig. 12.—Dr. Engelmann's 8-inch refractor. (Telescope.)

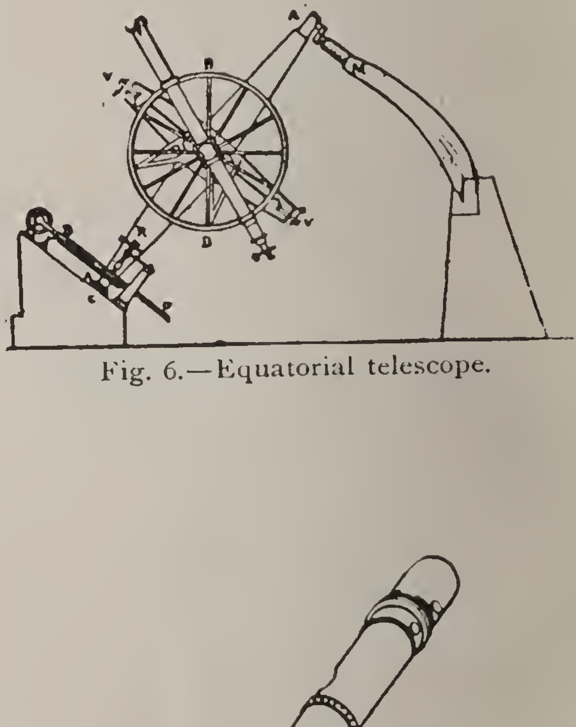


Fig. 6.—Equatorial telescope.

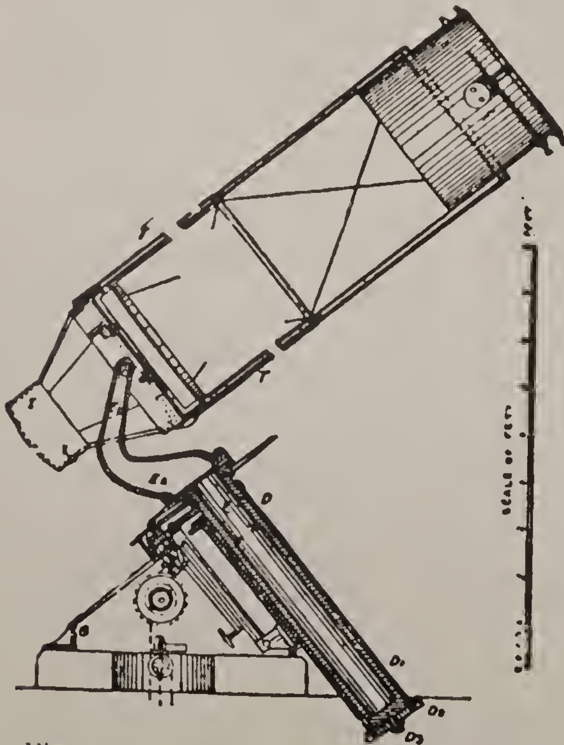


Fig. 16. ing telescope

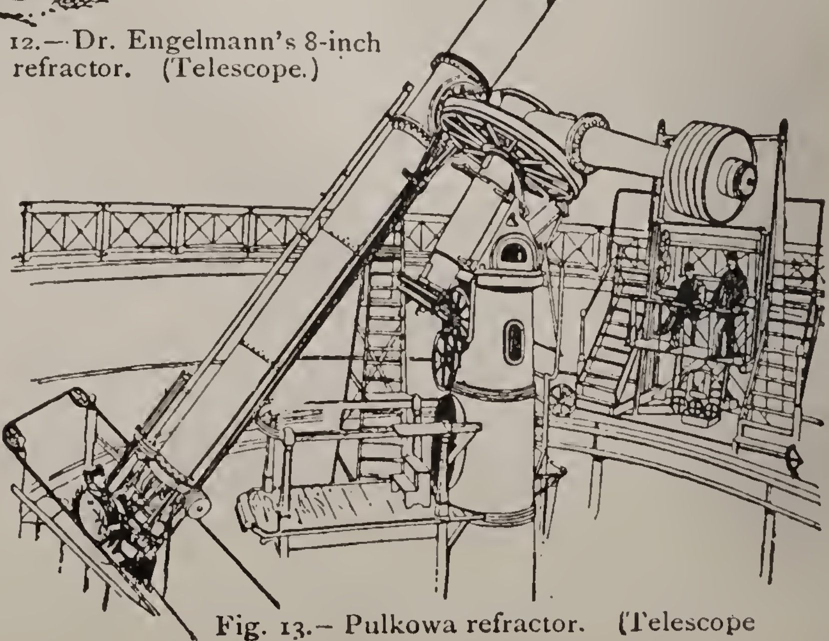


Fig. 13.—Pulkowa refractor. (Telescope

early as July, 1609. Galileo, in his *Nuncius Sidereus*, states that, happening to be in Venice about the month of May, 1609, he heard that a Belgian had invented a perspective instrument by means of which distant objects appeared nearer and larger, and that he discovered its construction by considering the effects of refraction. In his *Saggiatore* Galileo states that he solved the problem of the construction of a telescope the first night after his return to Padua from Venice, and made his first telescope next day by fitting a convex lens in one extremity of a leaden tube and a concave lens in the other one. A few days afterward, having succeeded in making a better telescope than the first, he took it to Venice, where he communicated the details of his invention to the public, and presented the instrument itself to the doge Leonardo Donatò, sitting in full council.

Kepler first explained the theory and some of the practical advantages of a telescope constructed of two convex lenses in his *Catoptrics* (1611). The first person who actually constructed a telescope of this form was Father Scheiner, who gives a description of it in his *Rosa Ursina* (1630). William Gascoigne was the first who practically appreciated the chief advantages of the form of telescope suggested by Kepler. The first powerful telescopes of this construction were made by Huygens, after much labor, in which he was assisted by his brother. With one of these, of twelve-feet focal length, he discovered the brightest of Saturn's satellites (Titan) in 1655, and in 1659 he published his *Systema Saturnium*, in which was given for the first time a true explanation of Saturn's ring. Cassini discovered Saturn's fifth satellite (Rhea) in 1672 with a telescope of 35 feet, and the third and fourth satellites in 1684 with telescopes made by Campani of 100 and 136 feet focal length. Huygens states that he and his brother made object-glasses of 170 and 210 feet focal length, and he presented one of 123 feet to the Royal Society of London. Auzout and others are said to have made telescopes of from 300 to 600 feet focus, but it does not appear that they were ever able to use them in practical observations. Bradley, on December 27, 1722, actually measured the diameter of Venus with a telescope whose object-glass had a focal length of 212¼ feet. In these very long telescopes no tube was employed, and they were consequently termed *aerial telescopes.* Huygens contrived some ingenious arrangements for directing such telescopes toward any object visible in the heavens—the focal adjustment and centering of the eye-piece being preserved by a braced rod connecting the object-glass and eye-piece. Other contrivances for the same purpose are described by La Hire and by Hartsoeker.

Newton was the first to construct a reflecting telescope. When in 1666 he made his discovery of the different refrangibility of light of different colors, he soon perceived that the faults of the refracting telescope were due much more to this cause than to the spherical figure of the lenses. Newton's first telescope so far realized his expectations that he could see with its aid the satellites of Jupiter and the horns of Venus. Encouraged by this success, he made a second telescope of 6⅓ inches focal length, with a magnifying power of thirty-eight diameters, which he presented to the Royal Society of London, in December, 1671. A third form of reflecting telescope was devised in 1672 by Cassegrain. No further practical advance appears to have been made in the design or construction of the instrument till the year 1723, when John Hadley (best known as the inventor of the sextant) presented to the Royal Society a reflecting telescope of the Newtonian construction, with a metallic speculum of six inches aperture and 62⅝ inches focal length, having eye-pieces magnifying up to 230 diameters.

The historical sequence of events now brings us to the discovery of the achromatic telescope. The first person who succeeded in making achromatic refracting telescopes seems to have been Chester Moor Hall, a gentleman of Essex, England. He argued that the different humors of the human eye so refract rays of light as to produce an image on the retina which is free from color, and he reasonably argued that it might be possible to produce a like result by combining lenses composed of different refracting media. After devoting some time to the inquiry he found that by combining lenses formed of different kinds of glass the effect of the unequal refrangibility of light was corrected, and in 1733 he succeeded in constructing telescopes which exhibited objects free from color. Hall did not publish his discovery and soon afterward Dollond made a similar instrument and patented it, thus disputing with Hall the honor of discovery.

In 1747 Euler communicated to the Berlin Academy of Sciences a memoir in which he endeavored to prove the possibility of correcting both the chromatic and the spherical aberration of an object-glass.

It is clearly established that Hall was the first inventor of the achromatic telescope; but Dollond did not borrow the invention from Hall. His discovery was beyond question an independent one.

The triple object-glass, consisting of a combination of two convex lenses of crown glass with a concave flint lens between them, was introduced in 1765 by Peter, son of John Dollond, and many excellent telescopes of this kind were made by him.

About the year 1774 William Herschel, then a teacher of music in Bath, began to occupy his leisure hours with the construction of specula, and finally devoted himself entirely to their construction and use. In 1778 he had selected the *chef d'œuvre* of some 400 specula which he made for the celebrated instrument of seven feet focal length with which his early brilliant astronomical discoveries were made. In 1783 he completed his reflector of 18$\frac{7}{10}$ inches aperture and twenty feet focus, and in 1789 his great reflector of four feet aperture and forty feet focal length. The fame of these instruments was rapidly spread by the brilliant discoveries which their maker's genius and perseverance accomplished by their aid. The reflecting telescope became the only available tool of the astronomer when great light grasp was requisite, as the difficulty of procuring disks of glass (especially of flint glass) of suitable purity and homogeneity limited the dimensions of the achromatic telescope. It was in vain that the French Academy of Sciences offered prizes for perfect disks of optical flint glass. Some of the best chemists and most enterprising glass-manufacturers exerted their utmost efforts without succeeding in producing perfect disks of more than three and one-half inches in diameter. All the larger disks were crossed by striæ, or were otherwise deficient in the necessary homogeneity and purity.

Pierre Louis Guinand, a humble watchmaker living near Chaux de Fond in Neuchâtel, Switzerland, was the first who succeeded in making marked progress in the manufacture of optical flint glass. After making preliminary experiments extending over seven years (1784-90), and nothing daunted by their comparative want of success, he erected a furnace near Les Brenets, and devoted most of his slender earnings (then derived from making the bells, or rather gongs, of repeating watches) to the fulfillment of his ambition. His persistency, courage and self-denial recall forcibly the story of Palissy. In 1805 he joined the optical establishment of Fraunhofer and Utzschneider and remained with them about nine years. During this period extensive experiments were instituted with remarkable success. It is said that the disks for the Dorpat refractor (9.6 inches aperture, with which the observations of Wilhelm Struve were made) were manufactured during this period, though the complete instrument was not delivered till 1823. Fraunhofer had, however, profited so fully by the suggestions of Guinand, and had probably also so far improved on the original methods, that he afterward succeeded in producing still larger object-glasses. After Fraunhofer's death in 1826 his successors Merz and Mahler carried out successfully the methods handed down to them by Guinand and Fraunhofer, and produced some large and excellent telescopes, which are hereafter mentioned. Meanwhile Guinand, having returned to his native country in 1814, resumed there the manufacture of disks of optical glass, discovered a method of removing striæ by breaking and reuniting the portions by heat, when the glass was in a plastic state, and eventually produced perfect disks up to eighteen inches in diameter. Most of these he disposed to Lerebours and Secretan, opticians in Paris, by both of whom some fine object-glasses were made. Guinand communicated his secrets to his sons before his death in 1823. About 1829 Bontemps entered into partnership with one of the sons, and another son carried on his father's manufacture in partnership with his mother. The latter firm was succeeded by Dauget of Soleure, whose exhibits of optical glass excited so much attention at the London exhibition of 1851. About 1848 Bontemps joined the firm of Chance Brothers of Birmingham, and thus carried the secret of Guinand's methods to England. It is not a little remarkable that the only firms in the world by whom large disks of optical glass have been produced trace their success to information derived more or less directly from Guinand. MM. Feil of Paris, who are direct descendants of Guinand, and Messrs. Chance Brothers of Birmingham are at the present time the only makers of optical glass in disks of larger diameter than twenty inches.

INSTRUMENTS, ETC.—We now proceed to give an account of the methods and principles of construction of the various kinds of telescopes, and to describe in detail special typical instruments, which, owing to the work accomplished by their aid or the practical advances exemplified in their construction, appear most worthy of record or study.

Refracting Telescope.—In its simplest form the telescope consists of a convex object-lens capable of forming an image of a distant object and of an eye-lens, concave or convex, by which the image so formed is magnified. When the axis of the eye-lens coincides with that of the object-glass, and the focal point of the eye-lens is coincident with the principal focus of the object-lens, parallel rays incident upon the object-glass will emerge from the eye-piece as parallel rays. These, falling in turn on the lens of the human eye, are converged by it and form an image on the retina. Fig. 1 shows the course of the rays when the eye-lens is convex (or positive), fig. 2 when the eye-lens is concave (or negative). The former represents Kepler's, the latter Lippershey's or the Galilean telescope. The magnifying power obviously depends on the proportion of the focal length of the object-lens to that of the eye-lens, that is,

$$\text{magnifying power} = F/e,$$

where F is the focal length of the object-lens and e that of the eye-lens. Also the diameter of the pencil of parallel rays emerging from the eye-lens is to the diameter of the object-lens inversely as the magnifying power of the telescope. Hence one of the best methods of determining the magnifying power of a telescope is to measure the diameter of the emergent pencil of rays, after the telescope has been adjusted to focus upon a star, and to divide the diameter of the object-glass by the diameter of the emergent pencil.

When a telescope is to be constructed for photographic purposes the aim should be to unite, as perfectly as possible, the rays near that portion of the spectrum which act most powerfully on the photographic plate to be employed. This latter point has been determined for the various photographic processes by Captain Abney.

If an object-glass is composed of three lenses of different kinds of glass it is theoretically possible to unite three instead of two points of the spectrum, besides improving the correction for spherical aberration. The most important practical applications of such a system have been—(1) the triple object-glass of John Dollond; (2) the application of a convex crown glass in front of an ordinary object-glass in order to alter its chromatic correction from that best suited for eye observations to that best suited for photographic observation. John Dollond's object-glass is generally described as a concave flint lens between two crown lenses. If the crown lenses are of similar glass, there is no gain as to the correction of the secondary spectrum; it becomes only possible to correct the spherical aberration more perfectly. Very few telescopes with triple object-glasses have been made since the days of John Dollond.

The problem of making a perfectly achromatic object-glass has been solved by Doctor Blair by employing fluid media, and he actually constructed an object-glass consisting of a plano-convex lens and a meniscus lens, both of crown glass with their convexities turned toward each other, the space between the lenses being filled with hydrochloric acid. Unfortunately such combinations are practically useless, not only on account of unavoidable leakage, but also because currents are set up in fluid lenses by changes of temperature, which correspond in effect with want of homogeneity in the flint lens in an ordinary object-glass.

Eye-Pieces.—The first substitute for the single lens of the Galilean and Kepler telescopes was the compound eye-piece invented by Rheita. Behind the convex eye-lens of the Kepler telescope he applied a second short telescope, consisting of two convex lenses, their distance being the sum of their focal lengths. The principal effect was to erect the inverted image, and thus to constitute the simplest form of the day eye-piece, or common terrestrial telescope. The next improvement was the Huygenian eye-piece, which consists of two convex lenses, the "field-lens," that next the object-glass, having its focal length to that of the "eye-lens" as 3 to 1; the distance between them is twice the focal length of the latter, the combination being so placed as to form the visible image half-way between the two. This eye-piece is achromatic in the sense in which an eye-piece is said to be so; a colorless image seen through it does not appear bordered with colored fringes. The common astronomical or positive eye-piece consists of two plano-convex lenses of equal lengths, having their convexities turned toward each other and separated by two-thirds of the focal length of either. The erecting or terrestrial eye-piece was invented by Dollond. It is convenient for telescopes of ordinary use, because it presents a non-inverted image to the eye, although at some sacrifice of light and definition.

In many telescopes constructed specially for star observation only the object-glass is over-corrected for color and under-corrected for spherical aberration; both these errors may sometimes be nearly eliminated by a properly constructed Huygenian eye-piece. But, when a telescope is to be used over a considerable range of field for micrometric measurements, it is obvious that the spherical aberration should be corrected by the object-glass alone. It is possible, however, to improve the appearance of objects somewhat in a telescope in which the chromatic aberration is over-corrected by employing an eye-piece somewhat under-corrected for color, and *vice versa;* but the only satisfactory plan is to have both object-glass and eye-piece as free as possible from both chromatic and spherical aberration. In order to secure this, or a very large field of view, many forms of eye-piece have been devised. Achromatic combinations have been substituted in some cases for the field-lens, in others for the eye-lens, in others for both simple lenses of the Ramsden eye-piece.

Reflecting Telescope.—The following are the various forms of reflecting telescopes. The Gregorian telescope is represented in fig. 3. AA and BB are concave mirrors having a common axis and their concavities facing each other. The focus of A for parallel rays is at F, that of B for parallel rays at *f*—between B and F. Parallel rays falling on AA converge at F, where an image is formed; the rays are then reflected from B and converge at P, where a second and more enlarged image is formed. Gregory himself showed that, if the large mirror were a segment of a paraboloid of revolution whose focus is F, and the small mirror an ellipsoid of revolution whose foci are F and P respectively, the resulting image will be plain and undistorted. The image formed at P is viewed through the eye-piece at E, which may be of the Huygenian or Ramsden type. The focal adjustment is accomplished by the screw S, which acts on a slide carrying an arm to which the mirror B is attached. The practical difficulty of constructing Gregorian telescopes of good defining quality is very considerable, because if spherical mirrors are employed their aberrations tend to increase each other, and it is extremely difficult to give a true elliptic figure to the necessarily deep concavity of the small speculum. Short appears to have systematically conquered this difficulty, and his Gregorian telescopes attained great celebrity. The use of the Gregorian form is, however, practically abandoned in the present day.

The Cassegrain telescope differs from the Gregorian only in the substitution of a convex hyperbolic mirror for a concave elliptical mirror as the small speculum. This form has two distinct advantages: (1) if spherical mirrors are employed their aberrations have a tendency to correct each other; (2) the instrument is shorter than the Gregorian, *cæteris paribus*, by twice the focal length of the small mirror. Fewer telescopes have been made of this than perhaps of any other form of reflector; but in comparatively recent years the Cassegrain has acquired importance from the fact of its adoption for the great Melbourne telescope.

The Newtonian telescope is represented in fig. 4. AA is a concave mirror whose axis is *aa*. Parallel rays falling on AA converge on the plane mirror BB, and are thence reflected at right angles to the axis, forming an image in the focus of the eye-piece E. The surface of the large mirror should be a paraboloid of revolution, that of the small mirror a true optical plane. This form is employed in the construction of most modern reflecting telescopes. A glass prism of total reflection is sometimes substituted for the plane mirror.

The Herschelian or front view reflector is represented in fig. 5. AA is a concave parabolic mirror, whose axis *ac* is inclined to the axis of the tube *ab* so that the image of an object in the focus of the mirror may be viewed by an eye-piece at E, the angle *bac* being equal to the angle *ca*E. This form was adopted by the elder Herschel to avoid the loss of light from reflection in the small mirror of the Newtonian telescope. It has several disadvantages. (1) The upper part of the observer's head must necessarily obstruct some of the rays which would otherwise fall on the large mirror; but when a telescope of very large aperture is employed the loss of light thus occasioned is comparatively insignificant. Moreover, disturbance of the air in front of the telescope is created by heat from the observer's head and body, and this is fatal to the best definition. (2) In consequence of the tilting of the mirror aberration is created, and this increases rapidly with the increased tilting. The construction is thus limited to telescopes in which the proportion of aperture to focal length is not too great. In Herschel's 40-feet telescope the proportion was 1 to 10, and the construction would hardly be applicable to modern telescopes, in which the proportion often rises to 1 to 5 or 6. Yet, when exceedingly faint objects have to be observed, this form of telescope has great advantages. Herschel found that some objects which he discovered with such an instrument could not even be seen when the same telescope was used in the Newtonian form. The front view telescope, however, has hardly been at all employed except by the Herschels. But at the same time none but the Herschels have swept the whole sky for the discovery of faint nebulæ; and probably no other astronomers have worked for so many hours on end for so many nights as they did, and they emphasize the easy position of the observer in using this form of instrument.

Construction of Object-Glasses.—The first point is the selection of glass disks of suitable quality. The requisites are (1) general transparency and freedom from mechanical defects, such as specks, air-bubbles, etc.; (2) homogeneity; (3) freedom from internal strain. The disk being roughly polished on the sides, faults of the first class are easily detected by inspection. In order to secure the maximum of light grasp for aperture it is desirable that the glass should be as colorless as possible; if the roughly polished disk is laid upon white paper the amount of discoloration can be readily estimated by comparing the color of the sheet as seen directly with that seen through the glass. Fraunhofer's glass was far from colorless, Dollond's more colored still; and we have shown that, for purposes when extreme light grasp is not an object, the less transparency of such glass to the blue rays of the spectrum affords advantages for a better correction of the chromatic aberration of rays in the brighter part of the spectrum. The amount of light excluded by specks, air-bubbles, or even scratches is quite insignificant; but these blemishes create diffraction phenomena and scattered light in the field, which are very injurious to the performance of the instrument, especially when faint objects are searched for in the neighborhood of brighter ones. It is essential for a telescope lens that the glass should be perfectly homogeneous; that is, the refractive index must be identical for every part of the disk. If a glass disk is not properly annealed—that is, if it has been too quickly cooled, so that the outer shell has hardened before the inner portion—the finally solidified mass must be in a state of tension, like that of "Rupert's drops." Unless cooled very gradually an optical disk would fly to pieces, but a very much smaller defect in the annealing process would be fatal for refined optical purposes. Changes of temperature would produce changes of curvature, and the lens would also change its form when successive portions of the strained outer shell were removed in the process of grinding and polishing. Fortunately defects in annealing are very easily detected by means of the polariscope.

The disks having been selected, their refractive and dispersive powers determined, and the radii of curvature computed, it remains to convert the disks into lenses with surfaces of the required curvature, and to complete the object-glass. The work consists of five distinct operations —(1) rough grinding by a revolving tool supplied with sand and water; (2) fine grinding with emery; (3) polishing with oxide of iron, rouge, or putty powder, the grinder being faced with fine cloth, satin, paper, or—best of all—pitch; (4) centering; (5) figuring and testing. These processes are essentially of a technical character, and can only be familiar to those who practice the art.

Construction of Specula.—The composition of metallic specula in the present day differs very little from that used by Sir Isaac Newton. Many different alloys have been suggested, some including silver, nickel, zinc, or arsenic; but that which has practically been found best is an alloy of four equivalents of copper to one of tin, or the following proportions by weight:—copper 252, tin 117.8. Such speculum metal is exceedingly hard and brittle, takes a fine white polish, and when protected from damp has little liability to tarnish. Shaping, polishing, and figuring of specula are accomplished by methods and tools precisely similar to those employed in the construction of lenses. The reflecting surface is first ground to a spherical form, the parabolic figure being given in the final process by regulating the size of the pitch squares and the stroke of the polishing machine.

Soon after Liebig's discovery of a process for depositing a film of pure metallic silver upon glass from a salt of silver in solution, Steinheil (*Gaz. Univ. d'Augsburg*, March 24, 1856), and later, independently, Foucault (*Comptes Rendus*, vol. xliv., February, 1857), proposed to employ glass for the specula of telescopes, the reflecting surface of the glass speculum to be covered with silver by Liebig's process. These silver-on-glass specula are now the rivals of the achromatic telescope, and it is not probable that many telescopes with metal specula will be made in the future. The best speculum metal and the greatest care are no guarantee of freedom from tarnish, and, if such a mirror is much exposed, as it must be in the hands of an active observer, frequent repolishing will be necessary. This involves refiguring, which is the most delicate and costly process of all. Every time, therefore, that a speculum is repolished, the future quality of the instrument is at stake; its focal length will probably be altered, and thus the value of the constants of the micrometer also have to be redetermined. Partly for these reasons the reflecting telescope with metallic mirror has never been a favorite with the professional astronomer, and has found little employment out of England. In England, in the hands of the Herschels, Rosse, Lassell, and De la Rue it has done splendid service, but in all these cases the astronomer and the instrument-maker were one. The silver-on-glass mirror has the enormous advantage that it can be resilvered with little trouble, at small expense, and without danger of changing the figure. Its chief work has been done in the hands of Draper and Common, who were the engineers, if not the actual constructors, of their own instruments. Glass is lighter, stiffer, less costly, and easier to work than speculum metal. The silvered mirrors have also some advantage in light grasp over those of speculum metal, though, aperture for aperture, the former are inferior to the modern object-glass.

Mounting of Telescopes.—The proper mounting of a telescope is hardly of less importance than its optical perfection. Freedom from tremor, ease and delicacy of movement, facility of directing the instrument to any desired point in the heavens, are the primary qualifications. Our limits forbid an historical account of the earlier endeavors to fulfill these ends by means of motions in altitude and azimuth, nor can we do more than refer to mountings such as those employed by the Herschels, or those designed by Lord Rosse to overcome the engineering difficulties of mounting his huge telescope of six feet aperture.

We pass, therefore, directly to the equatorial telescope, the instrument *par excellence* of the modern extra-meridian astronomer, and relegate to the article TRANSIT CIRCLE (*q.v.*) a description of those mountings in which the telescope is simply a refined substitute for the sights or pinules of the old astronomers. The equatorial in its simplest form consists of an axis parallel to the earth's axis, called the "polar axis;" a second axis, at right angles to this, called the "declination axis;" and a telescope fixed at right angles to the latter. In fig. 6 AA is the polar axis; the telescope is attached to the end of the declination axis; the latter rotates in bearings attached to the polar axis, and concealed by the telescope itself. The telescope is counterpoised by a weight attached to the opposite end of the declination axis. The lower pivot of the polar axis rests on a cup bearing at C, the upper pivot upon a strong metal casting MM, attached to a stone pier S. A vertical plane passing through AA is therefore in the meridian, and, when the declination axis is horizontal, the telescope moves in the plane of the meridian by rotation on the declination axis only. Thus, if a graduated circle BB is attached to the declination axis, together with the necessary microscopes or verniers V,V for reading it (see TRANSIT CIRCLE), so arranged that when the telescope is turned on the declination axis till it is parallel to AA the vernier reads 0° or 90°, and when at right angles to AA 90° or 0°, then we can employ the readings of this circle to measure the polar distance or declination of any star seen in the telescope, and these readings will also be true (apart from the effects of atmospheric refraction) if we rotate the instrument through any angle on the axis AA. Thus one important attribute of an equatorially mounted telescope is that, if it is directed to any fixed star, it will follow the diurnal motion of that star from rising to setting by rotation of the polar axis only. If we further attach to the polar axis a graduated circle DD, called the "hour circle," of which the microscope or vernier R reads 0 hours when the declination axis is horizontal, we can obviously read off the hour angle from the meridian of any star to which the telescope may be directed at the instant of observation. If the local sidereal time of the observation is known, the right ascension of the star becomes known by adding the observed hour angle to the sidereal time if the star is west of the meridian, or subtracting it if east of the meridian. Since the equatorial is unsuitable for such observations when great accuracy is required (see TRANSIT CIRCLE), the declination and hour circles of an equatorial are employed not for determination of the right ascensions and declinations of celestial objects, but for directing the telescope with ease and certainty to any object situated in a known position, and which may or may not be visible to the unaided eye, or to define approximately the position of an unknown object. Further, by causing the hour circle, and with it the polar axis, to rotate by clockwork or some other mechanical contrivance at the same angular velocity as the earth on its axis, but in the opposite direction, the telescope will automatically follow a star from rising to setting.

Fig. 6 may be taken as a practical example of the earlier equatorials as made by Troughton in England and afterward by Gambey for various Continental observatories. In the *Philos. Trans.* for 1824 (part 3, pp. 1–412) will be found a description by Sir John Herschel and Sir James South of the equatorial telescope which they employed in their measurements of double stars. The polar axis was similar in shape to that of fig. 6, and was composed of sheets of tinned iron. In Smyth's celebrated Bedford telescope the polar axis was of mahogany. Probably the best example of this type of mounting applied to a refractor is that made by the elder Cooke of York for Mr. Fletcher of Tarnbank; the polar axis is of cast iron and the mounting very satisfactory and convenient, but unfortunately no detailed description has been published. In recent years no noteworthy refractors have been mounted on this plan; but this type has been chosen by Grubb for the great Melbourne reflector, with marked ingenuity of adaptation to the peculiar requirements of the case. Fig. 6 shows the whole instrument on a small scale, and fig. 7 represents part of it on a larger scale, the upper part of the tube and polar axis being omitted. The figures show the telescope directed to the pole, the hour circle being set 6 hours from the meridian. The polar axis consists of a hollow cone C (fig. 7) of cast iron bolted to a hollow cast-iron tube H, to the lower side of which is attached a short steel axis carrying the driving sector EF and the hour circle R, and terminating in the lower pivot of the polar axis. This pivot *a* is terminated by a piece of chilled cast iron polished flat on its lower face, which face revolves in contact with a piece of bell metal, flat on its upper and partly spherical on its lower side, bearing in a correspondingly shaped annulus, formed to receive it in the cast-iron block which is attached to the pier. This arrangement enables the bell-metal cushion to take its own position when the direction of the polar axis is slightly changed in process of adjustment. The pressure of the pivot on its bearings, in the direction at right angles to the polar axis, is relieved by the sector A, which is forced up by the screw *d* acting through laminæ of steel springs. The end pressure of *a* upon its bearings is relieved by a weight. The friction of the upper pivot is relieved by a sector pressed up against it by the action of two weights. In this way, although the moving part of the telescope weighs 18,170 pounds, it can be turned with a pressure of 12½ pounds, acting at a radius of 20 feet. The driving sector EF is 5 feet in radius; its circular rim is accurately toothed to fit a square threaded endless screw E, which is turned by the driving clock. A toothed wheel attached to H and acted on by a pinion connected with a hand-wheel affords an easy means of setting the instrument in hour angle, or moving the telescope quickly in right ascension. The telescope is clamped by iron bands to the strong cast-iron cradle, which is cast with and forms one extremity of the declination axis. The counterpoise U is attached to the other extremity. There is an elegant arrangement for diminishing the friction of the declination axis, which our limits do not permit us to describe, and the means for clamping and giving slow motion in declination do not require special notice. The reader is referred for a fuller description to *Phil. Trans.* 1869, pp. 127-161. The telescope is of the Cassegrain form, the mirror having a 4-feet aperture and 30½-feet focal length.

The polar axis of the Greenwich equatorial consists of six iron tubes arranged so as to form two triangular braced beams connected by very strong elliptical wheels of cast iron, which carry the upper and lower pivots of the polar axis. These tubes are shown in section at the points T, fig. 8, which represents a section through the declination axis in the plane of the equator when the telescope is directed to a star at the equator (for the general arrangement of the mounting, see fig. 9). The driving circle is six feet in diameter, and turns freely on the lower pivot of the polar axis, under the action of the driving clock. The hour circle is graduated on the driving circle, and may be set to show sidereal time during the whole of a night's work; thus the observer, in order to direct the instrument on a particular object, has only to set an index connected with the polar axis to the star's right ascension upon the hour circle, without the trouble of computing the hour angle at the instant of observation. This convenient arrangement was first introduced by Airy. The whole mounting is very massive, but very inconvenient to use when a great many different objects have to be examined on the same night; but on account of its freedom from tremor and the excellence of its driving clock it should be very suitable for prolonged study of a single object or for long photographic exposures. The cut is engraved from a photograph of the model of the original polar axis.

Many more telescopes have been made of still another type, and it is now almost exclusively employed for the mounting of modern refractors. Its essential features are (1) a comparatively short polar axis and (2) a cross-head attached to the extension of the upper pivot of the polar axis, to carry the bearings of the declination axis. Fig. 10 shows the Dorpat refractor, the *chef d'œuvre* of Fraunhofer, and the first equatorial of any importance that was provided with clockwork. AA is the polar axis, B the hour circle graduated on the face and read by the vernier V. C is the driving clock, which turns an endless screw S, that gears in the toothed edge of the circle B. D is the cross head supporting at its extremities the bearings of the declination axis. The wooden telescope tube rests in a strong cradle FF of cast brass, which is screwed to a flange on one end of the declination axis; the declination circle EE, which is attached to its opposite end, serves to clamp the instrument in declination to the arm G. H is a weight acting on a lever which presses the wheels *k* (one only seen in the figure) against the upper pivot of the polar axis in order to relieve the friction of that pivot on its bearing. The counterpoise W balances the tube about the polar axis. M, M are counterpoise weights which act on levers *m*, *m*, whose fulcra are universal joints at *n* attached to the cradle. These weights serve to counterpoise the longer end of the tube and to check its flexure. QQ is the finder, a small telescope whose axis is parallel to the great telescope; having a low magnifying power and a large field of view, it serves to direct the large telescope to any object seen in the sky, which otherwise would be difficult to find in the comparatively limited field of the large telescope. The stand TTT is of oak.

About 1840 a great advance was made in the right direction by the Repsolds, of Hamburg, in the equatorial mounting of the Oxford heliometer. The driving circle was greatly increased in diameter, and placed at the upper end of the polar axis, and both the polar axis and the declination axis were made much stronger in proportion to the mass of the instrument they were destined to carry. (A figure of this instrument is given in the Oxford *Observations* for 1850.) About 1850 Thomas Cooke, of York, began his career as a maker of equatorial telescopes, and gave a new character to the German mounting. Fig. 7 represents a typical equatorial of his design. A strong cast-iron pillar is substituted for Fraunhofer's stand. On the semi-cylindrical top of the pillar rests the cast-iron box AA, which contains at its upper and lower extremities the bearings of the polar axis. Its mode of connection with the pillar permits the inclination of the box to be changed for adjustment of the inclination of the polar axis. The strong cross-head C, supporting the bearings of the declination axis, is of cast-iron, bolted to a flange on the upper pivot of the polar axis. Fraunhofer's cradle and wooden tube are abolished, and in their place is a cast-iron cylindrical tube D, flanged at both ends and also at the point where it is bolted to a corresponding flange on the end of the declination axis, all three flanges being cast in one piece with the central tube; the rest of the tube consists of two slightly tapered brass cylinders, bolted by strong flanges to the central tube D. The handle F clamps the arm H to the cross-head C at pleasure, and slow motion in declination is communicated by the handles at E and G. Two circles at K and M are attached to the upper part of the polar axis. To one of these motion is communicated by the tangent screw at M (turned by the clock N) acting on teeth cut at the edge of the circle. The other is a graduated hour circle read by two opposite microscopes, one of which is seen at P. The endless cord hanging down and holding a sliding ring at Q is employed to give slow motion in right ascension, in some instruments by moving the frame of the driving-screw in the direction of the axis of the screw, in others by moving differential wheels, which accelerate or retard the velocity of rotation of the driving-screw without affecting the rate of the clock. The declination circle RR is attached to the farther end of the declination axis, and is inconvenient of access. Cooke's stand is admirable for its symmetry and simplicity of design, its just apportioning of strength, and a general rigidity, with suitability of means to ends.

When much larger instruments are required the hour circle becomes inaccessible from the floor, and means have to be devised for reading both circles from the eye end. This was first accomplished by Grubb in the great refractor of twenty-seven inches aperture which he constructed for the Vienna observatory, represented in section in fig. 11. The observer's eye is applied to the small telescope E, which (by means of prisms numbered 1, 2, 3, 4) views the vernier attached to the cross-head simultaneously with the hour circle attached to the upper end of the polar axis. Light to illuminate the vernier and circle is thrown from the lamp L upon prism 4 by the prisms 6 and 5. Prism 1 is in the axis of the declination circle and always reflects rays along that axis, whatever the position of the telescope may be, while the prisms 2, 3, 4, 5, and 6 are attached to the cross-head and therefore preserve their relative positions to each other. Through the eye piece of the bent telescope E′ another hour circle attached to the lower end of the polar axis can be seen; thus an assistant is able to direct the telescope by a handle at H to any desired hour angle. A slight rotatory motion of the telescope E on its axis enables the vernier of the declination circle to be read through prism 1. The leading features of this fine instrument represent those of all Grubb's large telescopes. The mode of relieving the friction of the declination axis is similar to that employed in the Melbourne telescope and in the account of the Vienna telescope published by Grubb. The end friction of the polar axis is relieved by a ring of conical rollers shown in section beside the principal figure.

From this point we must condense further description into critical remarks on a few typical modern instruments.

Telescopes of Moderate Size for Micrometric Research only.—Fig. 12 shows the mounting of the eight-inch refractor, of nine feet focal length, at the private observatory of Doctor Engelmann, Leipsic. The object-glass is by Messrs. Clark of Cambridge, Mass., the mounting by the Repsolds of Hamburg. The declination circle reads from the eye end, and four handles for clamping and slow motion in right ascension and declination are situated near the observer's hands. The tube is of sheet steel, light, stiff, and free from tremor. The eye end carries the micrometer with an illuminating apparatus. The lamp near the eye end illuminates the field or the wires at pleasure, as well as the position circle of the micrometer and the declination circle; a separate lamp illuminates the hour circle. An excellent feature is the short distance between the eye-piece and the declination axis, so that the observer has to follow the eye end in a comparatively small circle; another good point is the flattening of the cast-iron center-piece of the tube so that the flange of the declination axis is attached as near to the axis of the telescope tube as is consistent with free passage of the cone of rays from the object-glass. For purposes of micrometric research with the ordinary micrometer this instrument is the most elegant, satisfactory, and useful that we know. The substitution of small incandescent electric lamps for the oil lamps would be an improvement. The great Pulkowa refractor (fig. 13) erected in 1885 is of thirty inches aperture and forty-five feet focal length. The object-glass is by Clark, the mounting by the Repsolds. The tube is cylindrical, of riveted steel plate, graduated in thickness from the center to its extremities, and bolted by very powerful flanges to a strong short cast-iron central tube, in which, as in Doctor Englemann's telescope (fig. 12), the attachment to the flange of the declination axis is placed as close as it can be to the axis of the tube without interfering with rays converging from the object-glass to any point in the field of view. A new feature in this instrument is the platform at the lower end of the polar axis, where an assistant can view the hour circle by one eye-piece and the declination circle by another (looking up the perforated polar axis), and where he can also set the telescope to any hour angle by one wheel, or to any declination by a second, with the greatest ease. The observer at the eye end can also read off the hour and declination circles and communicate quick or slow motions to the telescope both in right ascension and declination by conveniently placed handles. The eye end presents an appearance too complicated to be figured here; it has a micrometer and its illumination for the position circle, a micrometer head, and a bright or dark field, clamps in right ascension and declination and quick and slow motion in the same, a finder, microscopes for reading the hour and declination circles, an illuminated dial showing sidereal time and driven by a galvanic current from the sidereal clock, and counter weights which can be removed when a spectroscope or other heavy appliance is added. All these, although making up an apparently complicated apparatus, are conveniently arranged, and are all necessary for the quick and easy working of so large an instrument.

Fig. 14 shows the equatorial mounting by Warner & Swazey for the great object-glass of thirty-six inches aperture that Messrs. Clark have completed for the Lick trustees, and which may be supposed to express their latest ideas as to the mounting for a very large telescope. The Repsolds have a large driving circle at the upper end of the polar axis, thus avoiding torsion of the polar axis at the expense of greatly increased length of the cross-head. Grubb, by employing a driving arc, gets the telescope much closer to the polar axis with an increased radius for driving, and he makes the polar axis a very large hollow steel or cast-iron cylinder in which torsion is insensible. Both Grubb and the Repsolds seem to think that for the tube of the telescope all necessary rigidity can be attained with cylindrical tubes of riveted steel, the thickness of the successive sheets of which diminish from the center piece outward without making the extremities cone-shaped.

In these very large telescopes the arrangements for giving access to the eye end and for following its diurnal motion have hitherto proved a source of difficulty. The traveling stages of the new Pulkowa telescope are the most manageable and practical that have yet been contrived, but even they leave much to be desired. For energetic work the standing position is best, provided that the eye-piece is situated at the precise height above the stage which is most convenient for the observer, and that the altitude of the observed object is not greater than 60°. For altitudes above 60° a small chair with a back, the top of which is stuffed for the head to rest upon, is the best seat, provided that the observer's eye can be kept at the height of the eyepiece.

Mr. Lassell's reflector is represented in fig. 15. The polar axis is sufficiently rigid, but the long and comparatively slender forks which carry the pivots of the central cradle are elements of instability, especially when the instrument is directed to an object of considerable hour angle. There is a practical confession of this instability in the cross-bracing which connects the two forks, and which must be removed if the telescope is pointed to an object between the zenith and the elevated pole.

The best example of this type of instrument is the reflecting telescope of 36-inches aperture designed by Mr. A. A. Common, with which his exquisite photographs of nebulæ, etc., were made. The principal preliminary conditions which he laid down as necessary were the following:—(1) no tube properly so called, to avoid air-currents in the tube; (2) no mass of metal either below or at the side of the line joining the large and small mirrors, to avoid currents from possible difference of temperature between the mass of metal and the surrounding air; (3) an equatorial mounting capable of direction to any part of the visible heavens and of continued observation past the meridian without reversal; (4) an efficient means of supporting the mirror without flexure; (5) driving clock; circles to find or identify an object, and motions taken to eye end; (6) a mounting which will give the greatest amount of steadiness with the least amount of friction. Fig. 16 is a section of the instrument in the plane of the meridian. DD$_1$ is a cast-iron hollow cylinder, accurately bored out, attached to a strong base block. D$_2$ is a cover bolted on the bottom of this cylinder, in the center of which is a tapering steel pin D$_3$, which enters a corresponding hole in the bottom of the polar axis E, and serves as the lower pivot of the polar axis. The cylindrical part of the polar axis is accurately turned to a diameter one-eighth of an inch less than the outer cylinder, and the otherwise severe friction on the pin D$_3$ is relieved by filling in the space between D and E with mercury, so far as sufficient nearly to float the whole moving part of the telescope. The upper elbow-shaped part of the polar axis E$_2$ is flanged and bolted to the lower part. In the section at right angles to that exhibited in fig. 30 this elbow-shaped part is T-shaped, and the cross of the T is bored to receive the declination axis; and, as the elbow puts the polar axis considerably out of balance, the T-shaped head is carried forward of the axial line about one and a quarter inches so that the whole weight of the telescope above just restores the balance. Two heavy weights X,X counterpoise the eye end F with the four braced tubes T,T which support it. B is the declination circle. It is impossible to describe this fine instrument adequately within our limits.

In the *Proceedings* of the Royal Dublin Society Grubb describes a "siderostatic telescope." In fig. 17 TT is the tube of a telescope of four-inches aperture, which is mounted to rotate about its axis, the latter forming the polar axis. MM is a plane mirror reflecting rays from a star S to the object glass, so that its image can be viewed from the eye-piece at E. The star is retained in the field by the clock C. Stars of different declination can be viewed by rotating the mirror on its axis G, and in different hour angles by rotating the tube upon its axis. The instrument in European latitudes cannot command a view of the heavens between the elevated pole and the zenith unless the distance OG is made exceedingly great; even then only a limited range beyond the zenith is possible. The instrument is primarily intended for solar spectroscopy, and thus these drawbacks do not apply. The resulting advantage is that the observer may be in complete darkness, and his observations are not interrupted by change of position.

TELESPHORUS, bishop of Rome from about 128 till about 137, succeeded Sixtus I., and was followed by Hyginus. Eusebius in his *History* gives the date of the martyrdom of Telesphorus as the first year of Antoninus Pius (138) and in his *Chronicle* as the eighteenth year of Hadrian (135.)

TELFORD, THOMAS, civil engineer, was the son of a shepherd in Eskdale, Dumfriesshire, and was born in the valley of the Megget, August 9, 1757. In 1780 Telford went to Edinburgh, where he was employed in the erection of houses in the "New" town, and occupied much of his spare time in learning architectural drawing. Two years later he proceeded to London, finding employment in the erection of Somerset House. Having in 1784 superintended the erection of a house for the commissioner at Portsmouth dockyard, he next repaired the castle of Sir W. Pulteney, member for Shrewsbury, who conceived such a high opinion of his talents that he got him made surveyor of public works for the county of Salop. His earliest bridge was that across the Severn at Montford, finished in 1792. In the following year he was appointed engineer of the Ellesmere canal, which led to his being employed for the chief canals subsequently constructed in Great Britain, including the Caledonian (1804), the Gloucester and Berkeley (1818), the Grand Trunk (1822), the Macclesfield (1824), and the Birmingham and Liverpool Junction (1825). In 1803 he had been appointed engineer for the construction of 920 miles of roads in the Highlands of Scotland, a great part through very difficult country. Of the numerous bridges built in this line of roads mention may be specially made of that across the Tay at Dunkeld. An undertaking of equal magnitude and importance with that in the Highlands of Scotland was a system of roads through the most inaccessible parts of Wales, which involved the erection of the magnificent suspension bridge across the Menai Straits, begun in 1820, and the Conway bridge, begun in 1822. For the Austrian Government Telford built the Polish road from Warsaw to Brest. While the fame of Telford rests chiefly on his road and canal engineering, and the erection of the numerous bridges and aqueducts which this involved, he also did good work in harbor construction. His important works of this kind were, however, his improvement of the harbors of Aberdeen and Dundee, and the construction of St. Katherine's docks at London. In 1828-30 he drained the north level of the eastern Fen district, an area of 48,000 acres. The erection of the Dean Bridge, Edinburgh, and of the Broomielaw Bridge, Glasgow, and the improvement (1833-34) of Dover harbor were the principal achievements of his later years. He died September 2, 1834, and was buried in Westminster Abbey.

TELL. The story of William Tell's skill in shooting at and striking the apple which had been placed on the head of his little son by order of Gessler, the tyrannical Austrian bailiff of Uri, is so closely bound up with the legendary history of the origin of the Swiss Confederation that they must be considered together. Both appear first in the fifteenth century, probably as results of the war for the Toggenburg inheritance (1436–50).

The Tell story is first found in a ballad the first nine stanzas of which (containing the story) were certainly written before 1474. It is probably to this ballad that Melchior Russ of Lucerne (who began his *Chronicle* in 1482) refers in his account (from Justinger) of the evil deeds of the bailiffs in the Forest districts. He goes on to narrate how Tell, irritated by his treatment, stirred up his friends against the governor, who seized and bound him and was conveying him by boat to his castle on the Lake of Lucerne, when a storm arose, and Tell, by reason of his great bodily strength, was, after being unbound, given charge of the rudder on his promise to bring the boat safely to land. He steered it toward a shelf of rock, called in Russ' time Tell's Platte, sprang on shore, shot the bailiff dead with his cross-bow, and went back to Uri, where he stirred up the great strife which ended in the battle of Morgarten. In these two accounts, which form the basis of the Uri version of the origin of the Confederation, it is Tell and Tell only who is the actor and the leader. We first hear of the cruelties of Austrian bailiffs in the Forest districts in the *Bernese Chronicle* of Conrad Justinger (1420).

The Tell story and the "atrocities" story are first found combined in a MS. known as the *White Book of Sarnen*. Many details are given of the oppressions of the bailiffs: we hear of Gessler, of the meeting of Stoupacher of Schwyz, Fürst of Uri, and a man of Nidwald at the Rütli—in fact, the usual version of the legend. To give an instance of tyranny in Uri, the author tells us the story of the refusal of "der Thäll" to do reverence to the hat placed on a pole, of his feat of skill, and of his shooting the bailiff, Gessler, from behind a bush in the "hollow way" near Küssnacht. Tell is represented as being one of those who swore at the Rütli to drive out the oppressors; but the narrative of his doings is merely one incident in the general movement which began quite independently of him. The chronology is very confused, but the events are placed after Rudolph's election to the empire in 1273. Tell is the chief of the Rütli leaguers, and it is his deed which is the immediate occasion of the rising against the oppressors, which is dated in 1296. Mutius (1540) is the latest writer who, in his description of the origin of the Confederation, does not mention Tell and his act. The two stories are now firmly bound together; the version contained in the *White Book* is the accepted one, though small additions in names and dates are often made.

The story of the skillful marksman who succeeds in striking some small object placed on the head of a man or child is very widely spread: we find it in Denmark (Tokko), Norway (two versions), Iceland, Holstein, on the Rhine, and in England (William of Cloudesley). How it came to be localized in Uri we do not know; possibly, through the story of the Scandinavian colonization of Schwyz, the tale was fitted to some real local hero.

The alleged proofs of the existence of a real William Tell in Uri in the fourteenth century break down hopelessly. (1) The entries in the parish registers are forged. (2) As to the Tell chapels—(*a*) that in the "hollow way" near Küssnacht was not known to Melchior Russ and is first mentioned by Tschudi (1570). (*b*) That on Tell's Platte is also first mentioned in Tschudi. The document which alleges that the chapel was built by order of a "landsgemeinde" held in 1388, at which 114 men were present who had been personally acquainted with Tell, was never heard of till 1759. The procession in boats to the place where the chapel stands may be very old, but is not connected with Tell till about 1582. (*c*) The chapel at Bürglen is known to have been founded in 1582. Other documents and statements in support of the Tell story have even less claim to credit.

TELLER, Wilhelm Abraham, was the son of the Leipsic clergyman, Romanus Teller, who edited the earlier volumes of the *Englisches Bibelwerk* (in 19 vols., 1749–70), an adaptation for German readers of the exegetical works of Willet, Ainsworth, Patrick, Poole, Henry, and others. Teller was born at Leipsic, January 9, 1734, and studied philosophy and theology in the university there. His first learned production was a Latin translation of Kennicott's *Dessertation on the State of the Printed Hebrew Text of the Old Testament* (1756), which was followed the next year by an essay in which he expounded his own critical principles. In 1761 he was appointed pastor and professor of theology in the university of Helmstädt. Here he pursued his exegetical, theological, and historical researches, the results of which appeared in his *Lehrbuch des Christlichen Glaubens* (1764). In consequence of the storm of indignation the book provoked, Teller eagerly accepted an invitation from the Prussian cultus minister to the post of prebendary of Köln on the Spree, with a seat in the Berlin consistory (1767). Here he became one of the leaders of the rationalistic party, and one of the chief contributors to Nicolai's *Allgemeine Deutsche Bibliothek*. In 1772 appeared the most popular of his books, *Wörterbuch zum Neuen Testament* (6th ed., 1805). The object of this work was to recast the language and ideas of the New Testament and give them the form of eighteenth century illuminism. The edict of Wöllner (1788), and Teller's manly action as consistorialrath in defiance of it, led the Prussian Government to pass upon him the sentence of suspension for three months, with forfeiture of his stipend. He was not, however, to be moved by such means, and (1792) issued his work *Die Religion der Vollkommeneren*, an exposition of his theological position, in which he advocated at length the idea, subsequently often urged, of "the perfectibility of Christianity,"—that is, of the ultimate transformation of Christianity into a scheme of simple morality, with a complete rejection of all specifically Christian ideas and methods. This book represents the culminating point of German illuminism, and is separated by a long process of development from the author's *Lehrbuch*. Teller died December 9, 1804. In addition to the above works he wrote *Anleitung zur Religion überhaupt und zum Allgemeinen des Christenthums insbesondere* (1792); and besides his contributions to the *Allgemeine Deutsche Bibliothek*, he edited a popular and practically useful *Magazin für Prediger* (1792–1801).

TELLEZ, Gabriel, Spanish dramatist, better known as Tirso de Molina (his *nom de plume*), was born about the year 1570, and about 1613 entered the order of the Brothers of Charity at Toledo. In 1645 he became prior of the monastery of the order at Soria, where he died in 1648. His dramatic works are said to have numbered nearly 300, but of these only a small proportion are now extant.

TELLICHERRI, a seaport town of India, in Malabar district of Madras, situated in 11° 44′ 53″ N. latitude and 75° 31′ 38″ E. longitude. It is a healthy and picturesque town, built upon a group of wooded hills running down to the sea, and is protected by a natural breakwater of rock. The town with its suburbs occupies about five square miles, and was at one time defended by a strong mud wall. The citadel or castle still stands to the north of the town. The East India Company established a factory here in 1683 for the pepper and cardamom trade. In 1881 the population was 26,410.

TELLURIUM. See SELENIUM AND TELLURIUM.

TELPHERAGE. See TRACTION.

TEMESVÁR, a royal free city and capital of the county of Temes, is the chief town of southeastern Hungary. It lies on the navigable Béga canal and the river Béga, in 45° 47′ N. latitude and 21° 14′ E. longitude. The majority of the inhabitants follow industrial and commercial pursuits, and carry on a brisk trade in grain, flour, spirits, fruits, flax, and hemp with the neighboring districts and with Roumania and Servia, by means of the Arad-Temesvár and the Austrian-Hungarian State railways, as well as by the Béga canal and by road. The town possesses many charitable and educational establishments, and is a favorite place of residence on account of its neatness and cleanliness. It has been lighted by electricity since 1883. The population was 37,500 in 1886.

TEMMINCK, KONRAD JACOB, keeper of the Leyden museum of natural history, was especially distinguished as an ornithologist, and was the author of many magnificently illustrated systematic works. He was born in 1778 and died in 1857.

TEMPE. See THESSALY.

TEMPERA, or DISTEMPER, is a method of painting in which solid pigments are employed, mixed with a water medium in which some kind of gum or gelatinous substance is dissolved to prevent the colors from scaling off. Tempera is called in Italy "fresco a secco," as distinguished from "fresco buono," or true fresco, painted on freshly laid patches of stucco. The disadvantages of tempera painting are that it will not bear exposure to the weather; the pigments merely lie on the surface and do not sink into the stucco, as is the case with true fresco pigments; moreover, the medium used, being soluble in water, will not stand the rain. Its advantages are that the painter can work at leisure, and can also transfer or sketch his whole design on the dry finished surface; while in fresco work each portion of the design is hidden piece-meal as each new patch of stucco is applied (see RAPHAEL).

For panel and canvas paintings tempera continued in use till nearly the end of the fifteenth century, when the Flemish method of oil painting gradually took its place. In many cases with panel pictures of the latter part of the fifteenth century it is now difficult, if not impossible, to be sure whether they were painted in tempera or in oil, either because both methods were combined, or because an oil varnish has been laid over the tempera pictures, and so the pigments have absorbed oil out of the varnish and have thus practically become associated with an oil medium. The round panel of the Madonna and St. Joseph by Michelangelo may be mentioned as an example of these doubtful cases.

In the main the earlier tempera easel pictures were painted on wood—pear, poplar, or walnut being commonly used; but a few painters preferred in some cases to use canvas. In the case of wall paintings, both tempera and fresco were used together—the proportion of fresco work being gradually increased. In the thirteenth and most of the fourteenth century little more than the groundwork of the picture was painted in fresco, though this varied according to the custom of each painter. In the fifteenth century increased technical skill and rapidity of execution allowed much more complete work to be done in fresco, till at last nothing but a few finishing touches were done in tempera. After the first half of the sixteenth century the increasing use of oil painting, assisted by the artistic decadence of the age, caused the gradual disuse of both fresco and tempera.

A third process, often used during the earlier Middle Ages, was a sort of compromise between tempera and fresco. A finished stucco surface was prepared as for ordinary tempera, but before each day's painting the plaster was soaked with water, so that the pigments, laid on to the wet plaster, to some extent sank below the surface, though without penetrating as deeply as they would on newly mixed stucco.

TEMPERATURE OF THE BODY. Although the range of temperature varies in different parts of the human body, the normal temperature at completely sheltered parts of the surface amounts to 98.4°, or a few tenths, more or less, in temperate climates, and if there is a persistent elevation above 99.5°, or a depression below 97.3°, some form of disease is certainly indicated. In warm-blooded animals the temperature is generally 1° lower at completely sheltered parts of the surface than at the back of the mouth or other accessible internal parts. The average temperature is nearly 1° higher in the tropics than in the temperate regions. When the temperature rises in cases of disease, the following relation to its augmentation and that of the pulse has been established: an increase of temperature of 1° above 98° corresponds with an increase of ten beats of the pulse in a minute. The value of this mode of investigation in the early detection of disease lies in the fact that it has often furnished an important guide to treatment. We give in a condensed form a few of the more important of these observations. In ague, the temperature of the body begins to rise several hours before the beginning of the paroxysm, and after the disease seems to have disappeared a periodic increase of the temperature may still be detected, and as long as this continues the patient is not wholly cured. In typhoid fever the rise of temperature, or its abnormal fall, will indicate what is about to happen three or even four days before any change in the pulse or other sign of mischief has been observed. The sudden fall of temperature has thus denoted intestinal hemorrhage several days before it appeared in the stools. When a person who yesterday was healthy exhibits this morning a temperature above 104°, it is almost certain that an attack of ephemeral fever or ague is coming on, and should the temperature rise up to or beyond 106°, the case will certainly turn out one of ague or some other form of malarious fever. If during the first day of illness the temperature rises to 106°, it is certain that the patient does not suffer from typhus or typhoid fever; and if the temperature of a patient who exhibits the general signs of pneumonia never reaches 101.7°, it is certain that there is no soft infiltration of the lungs. In typhoid fever a temperature which does not exceed on any evening 103.5° indicates a mild course of fever. A temperature of 105° in the evening and 104° in the morning shows that the attack is a severe one and forebodes danger during the third week. On the other hand, a temperature of 101.7° or below in the morning indicates a very mild attack, or the commencement of convalescence. In pneumonia a temperature of 104° and upward indicates a severe attack. In acute rheumatism a temperature of 104° is an alarming symptom. In cases of jaundice an increase of temperature shows that the disease is advancing and that complications are setting in. In short, a fever temperature of 104° or 105° in any disease indicates that its progress is not checked and that complications may still occur. As a general rule, when the temperature rises continuously to 106.2° the prognosis is unfavorable, and when it rises to 110° a fatal issue is almost certain. The diseases in which the highest temperatures have been observed are scarlatina, in which it has been noted at 112°, and tetanus, in which, at the period of death, it was 112.5°, and an hour afterward was 113.8°.

TEMPERING METALS. A peculiar effect is produced upon some metals by heating them to redness, and then suddenly cooling them. By this means extreme hardness is obtained, especially in steel, which is so susceptible to this process, called tempering, that almost any degree of hardness and brittleness can be obtained. If we make a piece of steel red hot, and then plunge it into cold water, it becomes hard and brittle when cold. But if we reheat the metal and allow it to cool slowly, it again becomes soft and malleable as before. Moreover, if we again reheat it, but not to redness, and cool it suddenly, it is still further softened. If, before reheating, the surface has been polished a beautiful shade of color is produced by the heat, which is varied according to the temperature employed, and so exactly is this the case that the experienced manipulator is entirely guided by the color produced, instead of by the heat applied. For ordinary operations, the metal is cooled by plunging it in cold water, but oil, mercury, and saline solutions are used for special purposes.

TEMPERANCE SOCIETIES. (See PROHIBITION PARTY.) The modern temperance movement may be said to date from the publication at Philadelphia, in 1785, of Dr. Benjamin Rush's essay on "The Effects of Ardent Spirits on the Human Body and Mind," which was republished in the *Gentleman's Magazine* of 1786, and had a wide circulation. The distinction which he draws between distilled and fermented liquors has, however, no foundation in fact, the difference being one of degree and not of kind. In 1808 Dr. Lyman Beecher and Dr. B. J. Clark, both readers of Rush, took action, and the result of the work of the latter was the formation of what is believed to be the first modern temperance society. It was formed in Greenfield, Saratoga county, N. Y., as an anti-spirits association, and still remains a teetotal society. This example was soon followed elsewhere, the early societies all restricting their scope to advocacy of moderation in the use of distilled liquors, and placing no inhibition upon fermented drinks. The work made further progress when the American Temperance Society was founded in 1826. Three years later Prof. John Edgar, of Belfast, called attention to the need for similar work in Ireland; and John Dunlop nearly at the same time organized a temperance society in Glasgow. In 1830 the first English temperance society was founded at Bradford. After the formation of the distinctive total abstinence organizations, the moderation societies died of inanition.

In Ireland Father Theobald Mathew became president of the Total Abstinence Society in Cork in 1838, and the "pledge" was taken from his hands by crowds; before he died in 1856 between 3,000,000 and 4,000,000 persons are said to have received it from him in the course of his journeys. The adjective "teetotal" was first used in September, 1833, by Richard Turner, a reformed drunkard, to express the thoroughgoing principle of total abstinence, but whether he coined the word, or whether it was merely a stuttering pronunciation of "total," or an old dialect word has been disputed. The early teetotalers were earnest missionaries. In consequence of their efforts societies and leagues multiplied, periodicals were established, and, notwithstanding many failures and apparent retrogressions, the temperance movement progressed. A vehement controversy arose at an early period as to the use of sacramental wine, and the nature of the wines mentioned in Scripture was discussed in innumerable pamphlets. The result has been that in a number of cases the wine now used for sacramental purposes is understood to be unfermented. The enactment of the Maine Liquor Law in America in 1851 (see PROHIBITION) led to the formation, in 1853, of the United Kingdom Alliance, which has for its object the suppression of the liquor traffic by legislation, and with a view to this suggests that a power of local veto should be placed in the hands of the rate-payers. This proposal took parliamentary form in the Permissive Bill of Sir Wilfrid Lawson, which was ultimately withdrawn and replaced by a "local option" resolution, which has been thrice affirmed by the House of Commons.

In 1868 the Good Templar order was introduced into England from the United States, where it had come into existence several years earlier. In England it made rapid progress, until it was seriously checked by a dispute arising out of the Negro question, but the two sections have again reunited (1887). The London Temperance Hospital for the non-alcoholic treatment of disease was opened in October, 1873. The importance of training the young was early recognized by the leaders of temperance reformation, and the labors of Dr. R. B. Grindrod of Manchester and Mrs. Carlile of Dublin led to the formation of bands of hope, which are now found in connection with many places of worship. The juvenile temples of the Good Templar order also work in the same direction. The Woman's Christian Temperance Union, founded in the United States in 1874, is one of the latest forms of temperance activity. A branch was organized in Great Britain in 1876; and in 1883 the World's Woman's Christian Temperance Union came into existence.

The temperance movement has now branched out into a multitude of organizations in the United Kingdom, of which the Railway Temperance Union, the post-office temperance societies, and associations connected with the army and navy are types. The organizations of a more general character are the United Kingdom Alliance, which is very active in the dissemination of teetotal doctrines generally, the National Temperance League, the Scottish Temperance League, the British Temperance League, the Scottish Permissive Bill Association, the Irish Temperance League, and the Irish Association for the Prevention of Intemperance. Next to these come the secret orders, of which the Rechabites, Sons of Temperance, and Sons of the Phœnix are large benefit societies. The Independent Order of Good Templars is non-beneficiary, and seeks in its "lodges" to provide social attractions, and at the same time to train the members in temperance work; it is probably the largest voluntary association in the world.

The oldest organization in America is the Sons of Temperance (1842), now numbering about 80,000 members. The Independent Order of Good Templars (1851) is the largest, its membership approaching 100,000. Both these, as also the Royal Templars of Temperance (1877) and the Templars of Honor and Temperance (1845), are mutual benefit societies. The Woman's Christian Temperance Union, the National Temperance Society and Publication House (New York), and the National Prohibition Party are active in educational work. The Woman's Christian Temperance Union is the outgrowth of "the Women's Crusade" (1872), a remarkable uprising among the women of Ohio and Pennsylvania against the liquor traffic. The organization was effected in 1874, and has since spread throughout the United States, its membership now numbering nearly 500,000. Its influence has been widely felt in legislatures and in elections in which prohibitory laws have been voted upon. With the exception of the Church Temperance Society of the Protestant Episcopal Church, which has the "double basis," all the temperance societies of the United States are based on the doctrine of total abstinence; and, with the additional exception of the Father Mathew Total Abstinence Societies of the Roman Catholic Church, they all advocate the principle of prohibition.

TEMPLARS, KNIGHTS. Perhaps the most renowned of the three great military orders founded in the twelfth century for the defense of the Latin kingdom of Jerusalem is that of the Knights Templars (*pauperes commilitones Christi templique Salomonici*) though abolished long before its rivals.

The Templars almost from their foundation had their quarters in the palace of the Latin kings, which had been the mosque of Mount Moriah. This palace was also known as Solomon's temple, and it was from this *templum Salomonis* that the Templars took their name. About the year 1118 a Burgundian knight, Hugh de Paganis, bound himself and eight comrades by a vow to the patriarch of Jerusalem to guard the public roads, to live as regular canons, and to fight for the King of Heaven in chastity, obedience, and self-denial. Baldwin II. granted them quarters on Mount Moriah and recommended their cause to St. Bernard. Under his patronage the papal legate, Matthew, bishop of St. Albano, presided at the council of Troyes in January, 1128, for the purpose of drawing up or confirming the statutes of the new order. The seventy-two statutes then drawn up met with the approval of Pope Honorius II. and the patriarch of Jerusalem, and became the groundwork of the later and more elaborate "*Règle du temple.*" Long before St. Bernard's death (1153) the new order was established in almost every kingdom of Latin Christendom.

After the council of Troyes Hugh de Paganis went to England and induced a number of English knights to follow him to the Holy Land. Among these was Fulk, count of Anjou, who would thus seem to have been a Templar before assuming the crown of Jerusalem in 1131. Hugh de Paganis died about the year 1136 and was succeeded by Robert de Craon, who is said to have been Anselm's nephew. Everard de Barris, the third master, was conspicuous in the second crusade.

Thenceforward for 140 years the history of the Templars is the history of the CRUSADES (*q.v.*). In 1149 the Templars were appointed to guard the fortress of Gaza, the last Christian stronghold on the way toward Egypt. Four years later the new master, Bernard de Tremelai, and forty of his followers, bursting into Ascalon, were surrounded by the Saracens and cut off to a single man. Next year the rumor went abroad that they had sold a noble, half-converted Egyptian prince, who had fallen into their hands, to chains and certain death for 60,000 aurei. In 1166 Amalric, the Latin king of Jerusalem, hanged twelve Templars on a charge of betraying a fortress beyond the Jordan to an emir of Núr al-Dín of Damascus. The military power of Núr al-Dín (1145–1173) was a standing menace to the Christian settlements in the East. Edessa had fallen to the prowess of his father (1144–45); Damascus was conquered by the son (1153), who four years earlier had carried his depredations almost to the walls of Antioch, and in 1157 laid siege to the Christian town of Paneas near the sources of the Jordan. In the disastrous fight that followed for the safety of the fortress of the Hospitalers, Bertrand de Blanquefort, the master of the Templars, and Odo de St. Amand, one of his successors, were taken prisoners. Bertrand was released later when Manuel was preparing to march against Núr al-Dín. But jealousy or honor led the Templars to oppose Amalric's Egyptian expedition of 1168; and the wisdom of their advice became apparent when the renewed discord on the Nile led to the conquest of Egypt by Asad al-Dín Shírkúh, and thus indirectly to the accession of Saladin, in 1169. In 1170 they beat Saladin back from their frontier fortress of Gaza; and seven years later they shared in Baldwin IV.'s great victory at Ascalon. Meanwhile Saladin had possessed himself of Emesa and Damascus (1174–75), and, as he was already lord of Egypt, his power hemmed in the Latin kingdom on every side.

During Odo's mastership the Old Man of the Mountains sent to Amalric offering to accept the Christian faith if released from the tribute he had paid to the Templars since somewhere about 1149. The Templars murdered the envoys on their return (*c.* 1172). Amalric demanded that the offenders should be given up for justice. Odo refused to yield the chief culprit, though he was well known, and invoked the protection of the pope. Amalric had to vindicate his right by force of arms at Sidon, and died while preparing to take stronger measures. The power of Saladin was now (1184) increasing daily; Baldwin IV. was a leper, and his realm was a prey to rival factions. There were two claimants for the guardianship of the state—Raymond III. of Tripoli and Guy de Lusignan, who in 1180 had married Sibylla, sister of the young king. Baldwin inclined to the former, against the patriarch and Arnold de Torroge.

The coronation of Guy was the triumph of Reginald of Châtillon, once prince of Antioch, and Saladin's deadliest foe. It was at the same time the overthrow of Raymond's ambition; and both Latin and Arabic writers are agreed that the Christian count and the Mohammedan sultan now entered into an alliance. To break this friendship and so save the kingdom, the two grand-masters were sent north to make terms with Raymond. But the rash valor of the Templars provoked a hopeless contest with 7,000 Saracens. The grand-master of the Hospitalers was slain; but Gerard made his escape with three knights to Nazareth (May 1, 1187). In this emergency Raymond became reconciled with Guy. Once more it was the Templars' rashness that led to the disastrous battle of Hittin (July 4th). Gerard and the king fell into the hands of Saladin, but were released about a year later; Raymond of Tripoli made his escape through treachery or fortune; and 230 Templars fell in or after the battle, for the fight was scarcely over before Saladin ordered all the Templars and Hospitaliers to be murdered in cold blood. One after another the Christian fortresses of Palestine fell into the hands of Saladin. Jerusalem surrendered on October 2–3, 1187, and the treasures of the temple coffers were used to purchase the redemption of the poorer Christians, part of whom the Templar warriors guarded on their sad march from the Holy City to Tripoli. Part of their wealth was expended by Conrad of Montferrat in the defense of Tyre; but, when this prince refused to admit Guy to his city, both the Templars and the Hospitaliers from the neighboring parts flocked to the banner of their released king and accompanied him to the siege of Acre (August 22, 1189).

On the fall of Acre Philip Augustus established him self in the palace of the Templars, who are, however, stated to have sympathized with Richard. This king sold them the island of Cyprus for 100,000 besants; but, unable to pay the purchase money, they transferred the debt and the principality to Guy of Lusignan. In the disputes for the Latin kingdom of the East the Templars seem to have supported Guy, and, like Richard, were credited with having had a hand in the murder of Conrad of Montferrat (April, 1192). When Acre was recovered, the Templars, like the Hospitaliers, received their own quarters in the town, which from this time became the centre of the order. On the death of Henry of Champagne (1197) they vetoed the election of Raoul de Tabarie; after the death of his successor Amalric they refused to renew the truce with Saladin's brother, Saif al-Dín, and led an expedition against the Saracens before the arrival of the new king, John de Brienne, at whose coronation in 1210 William de Chartres, the grand-master, was present. Seven years later, with the aid of Walter de Avennis and of the Teutonic Knights, they commenced the building of their fortress of Castle Pilgrim, near Acre, on a rocky promotory washed by the Mediterranean on every side except the east. It was from this castle that in May, 1218, the fifth crusade started for the expedition against Egypt. From the very first the Templars seem to have been opposed to Frederick II., and when he landed at Acre (September 7, 1228) they refused to march under the banners of an excommunicated man, and would only accompany his host from Acre to Joppa in a separate body. Frederick was not slow to avenge himself; he left Jerusalem abruptly, publicly insulted the grand-master, demanded the surrender of their fortresses, and even laid siege to Castle Pilgrim. He left Acre on May 3, 1229, and on landing in Apulia gave orders to seize the estates of the order and chase all its members from the land.

Long before the expiration of Frederick's peace Europe was preparing for a fresh crusade against the now divided realm of the Ayyubids. Theobald of Navarre and his crusaders reached Palestine about August, 1239. The Templars shared in the great defeat near Jaffa, an engagement which their temerity had done much to provoke (November 13, 1239). It was in this moment of danger that the sultan of Babylon called in the barbarous Khárizmians, whom the Mongol invasions had driven from their native lands. These savages, entering from the north, flowed like a tide past the newly built and impregnable Templar fortress of Safed, swept down on Jerusalem, and annihilated the Christian army near Gaza on St. Luke's day (October 18), 1244. From this blow the Latin kingdom of the East never recovered; 600 knights took part in the battle; the whole army of the Templars, 300 in number, was present, but only eighteen survived, and of 200 Hospitalers only sixteen.

Recognizing the fact that the true way to Jerusalem lay through Egypt, Louis IX. led his hosts to the banks of the Nile, being accompanied by the Templars. Their master, William de Sonnac, attempted in vain to restrain the rash advance of the count of Artois at the battle of Mansúra (February 8, 1250), which only three Templars survived.

But, though weak against external foes, the Templars were strong enough for internal warfare. In 1277 they espoused the quarrel of the bishop of Tripoli, formerly a member of the order, against his nephew Bohemond, prince of Antioch and Tripoli, and commenced a war which lasted three years. In 1276 their conduct drove Hugh III., king of Cyprus and Jerusalem, from Acre to Tyre. In the ensuing year, when Mary of Antioch had sold her claim to the crown to Charles of Anjou, they welcomed this prince's lieutenant to Acre and succeeded for the moment in forcing the knights of that city to do homage to the new king. Thirteen years later (April 26, 1290), Tripoli fell, and next year Acre, after a siege of six weeks, at the close of which (May 16th), William de Beaujeu, the grand-master, was slain. The few surviving Templars elected a new master, and, forcing their way to the seashore, sailed for Cyprus, which now became the headquarters of the order.

For more than a hundred years the Templars had been one of the wealthiest and most influential factors in European politics. If we confine our attention to the East, we realize but a small part of their enormous power. Two templars were appointed guardians of the disputed castles on the betrothal of Prince Henry of England and the French princess in 1161. Other Templars were almoners of Henry III. of England and of Philip IV. of France. One grand-master was godfather to a daughter of Louis IX.; another, despite the prohibition of the order, is said to have been godfather to a child of Philip IV. They are reported to have reckoned a pope (Innocent III.) among their members and to have refused admission to a king and his nephew, (Philip IV.) Their property was scattered over every country of Christendom, from Denmark to Spain, from Ireland to Cyprus. Before the middle of the thirteenth century Matthew Paris reckoned their manors at 9,000, Alberic of Trois Fontaines at 7,050, whereas the rival order of St. John had barely half the latter number. Some fifty years earlier their income from Armenia alone was 20,000 besants. Both in Paris and in London their houses were used as strongholds for the royal treasure. In the London temple Hubert de Burgh and the Poitevin favorites of Henry III. stored their wealth; and the same building was used as a bank into which the debtors of the foreign usurers paid their dues. From the English Templars Henry III. borrowed the purchase money of Oléron in 1235; from the French Templars Philip IV. exacted the dowry of his daughter Isabella on her marriage with Edward II. To Louis IX. they lent a great part of his ransom, and to Edward I. of England no less than 25,000 *livres Tournois*, of which they remitted four-fifths. James de Molai, the last grand-master, came to France in 1306 with 150,000 gold florins and ten horse-loads of silver. In the Spanish peninsula they occupied a peculiar position, and more than one king of Aragon is said to have been brought up under their discipline.

Such were the power and wealth of the Templars at the time when Philip IV. of France accused them of heresy and worse offenses, had them arrested (October 13, 1307), and forced them to confess by tortures of the most excruciating kinds. Five years later (May 26, 1312) the order was suppressed by decree of the council of Vienne and its goods transferred to the hospital of St. John.

The order consisted of (1) knights, (2) chaplains, and (3) men-at-arms (*armigeri*, *clientes*, and *servientes*). The knights were either bound for life or for a fixed period, and were the only members entitled to wear the white mantle. Married brethren were admitted; but no woman might enter the order. Each knight might keep three horses and one man-at-arms, who, like his master, might be bound for life or only for a time. Like Augustinian canons, they were to attend daily services; but the soldier outwearied with his nightly duties might on certain conditions absent himself from matins with the master's consent. Two regular meals were allowed for each day; but to these might be added, at the master's discretion, a light collation toward sunset. Meat might be eaten thrice a week; and on other days there was to be a choice of vegetable fare so as to suit the tenderest stomach. Brethren were to eat by couples, each keeping an eye on his fellow to see that he did not practice an undue austerity. Wine was served at every meal, and at those times silence was strictly enjoined that the words of Holy Writ might be heard with the closest attention. Special care was to be taken of aged and ailing members. Every brother owed the most absolute obedience to the master of the order, and was to go wherever his superior bade him without delay, "as if commanded by God." All undue display in arms or harness was forbidden. Parti-colored garments were forbidden; black or dusky-brown (*burellus*) was to be worn by all except the knights. The hair was to be worn short, and a rough beard became one of the distinguished marks of the order. Hunting and hawking were unlawful; and the very allusion to the follies or secular achievements of earlier life was forbidden. A lion, however, being the type of the evil one, was legitimate prey. Strict watch was kept on the incomings and outgoings of every brother, except when he went out by night to visit the Sepulcher of our Lord. No letter, even from the nearest relative, might be opened except in the master's presence; nor was any member to feel annoyance if he saw his relative's gift transferred at the master's bidding to some other brother. The brethren were to sleep in separate beds in shirts and breeches, with a light always burning in the dormitory. Those who lacked a mattress might place a piece of carpet on the floor; but all luxury was discouraged. The order recognized two governing bodies—the first, a meeting for ordinary business, to which only the wiser members were summoned, the second, one for extraordinary affairs, such as the granting of lands or the reception of new members, on which occasion the master might summon the whole community. Even at these last assemblies the master seems to have decided on the final action (c. 59). A term of probation was assigned to each candidate before admission; and a special clause discouraged the reception of boys before they were of an age to bear arms. Lastly, the brethren of the Temple were exhorted to shun the kiss of every woman, whether maid or widow, mother, aunt, or sister.

The general spirit of the Templar statutes remained unaltered to the end, though the increasing wealth of the order gave rise to a number of additional rules. The grand-master was always head of the society; his instructions were binding on every member, and the very laws were at his discretion. He was elected by thirteen brothers, chosen by a peculiar method of cooptation, and all, if possible, belonging to different nations. Next to him in dignity came the seneschal, on whom the duties of the absent master devolved. The marshal had charge of the steeds and accoutrements; he also commanded the knights and men-at-arms, the latter of whom seem in time of war to have been at the disposal of the turcopolier. The commander of the kingdom guarded the treasure-house, to which even the grand-master might not have a key; the commander of the city of Jerusalem had charge of the True Cross in time of war. There were twelve or perhaps more commanders or preceptors of the different provinces and kingdoms of Europe and Asia—Jerusalem (kingdom and city), Acre, Tripoli, Antioch, France, England, Poitou, Aragon, Portugal, Apulia, and Hungary. The order prided itself specially on the splendor of its religious services, the abundance of its alms, and its reckless valor for the Christian faith. At the time of its suppression it was calculated to number 15,000 members. Three MSS. of its ancient statutes, written in Old French, are still extant at Dijon, at Paris, and at Rome. Of these the first was transcribed about 1200, the last two from 1250 to 1300. They have been published by M. Maillard de Chambure (Paris, 1840).

TEMPLE. The temple is an institution common to religions of natural growth which have reached a certain stage, and in most languages bears a name expressing that it is the house or palace erected by men as a habitation for their god (Greek, *ναός*; Hebrew, *hēkal*, "palace," or *bēth ĕlōhīm*, "house of God;" Latin, *ædes sacræ*). In this connection the term "house of God" has quite a different sense from that which we connect with it when we apply it to a Christian place of worship. A temple is not a meeting-place for worshipers; for many ancient temples were open only to priests, and as a general rule the altar, which was the true place of worship, stood not within the house but before the door. The temple is the dwelling house of the deity to which it is consecrated, whose presence is marked by a statue or other sacred symbol. Again, a temple implies a sanctuary; but a sanctuary or holy spot does not necessarily contain a temple.

There were temples among the Hebrews before the time of Solomon, whether private, like that of Micah (Judges xvii. 5), or public, like that of Shiloh, where the ark was housed for a time (see TABERNACLE). Solomon's enterprise was not, therefore, absolutely novel, and in point of size his temple can hardly have surpassed those just mentioned. The chief motives in the internal decoration of Solomon's temple were the palm tree and the cherub. The former is one of the commonest Phœnician symbols, and the Phœnician associations of the latter are clear from Ezek. xxviii. The cherub, in fact, is only a variety of the sphinx, and the way in which the palm and winged animal figures were combined in the Phœnician decoration is shown in a fragment of alabaster preserved in the Louvre.

The adytum of the temple was a cube of twenty cubits each way; the outer chamber was of the same breadth, but forty cubits long and thirty high. The portico was of the breadth of the main building and ten cubits deep. A peculiar feature in Solomon's temple was that all its sides except the front were surrounded by three stories (each five cubits high) of small chambers, five cubits wide on the ground floor, six on the first floor, and seven on the second, the increasing breadth being evidently got by reducing the thickness of the walls by one cubit at each floor. Thus, allowing for the walls, the external measurements of the house cannot have been much less than forty-five cubits by ninety. The aspect of the façade can only be conjecturally determined. Several Phœnician temples, known from coins, show on their façade a high-pitched gable (Byblus, Tripolis), and that of Tripolis has also a flat-roofed wing on each side of the gable and portico, which would answer to the ends of the side chambers in our temple. But perhaps the closest analogy to the frontispiece of Solomon's temple is the often cited one of the temple at Paphos. Here the portico between the side wings is flanked by two slender towers, and in the end of the nave above the door there are square-topped windows. Solomon's temple had "windows of beams" (or "with horizontal lintels") "framed in," which, as Prof. J. H. Middleton observes, is naturally explained on the analogy of the windows between the beams in the wooden gables of Coptic churches. That Solomon's temple had towers cannot be proved, for the height of the porch is not given in Kings, and the 120 cubits of 2 Chron. iii. 4 is obviously an excessive figure, due to a mistake of the writer or of a copyist. Another feature of Solomon's temple is exactly reproduced at Paphos. On each side of the door the coin shows a fantastic pillar standing free. Solomon erected two such pillars of bronze, eighteen cubits high (1 Kings vii. 15 *seq.*), with capitals of "lily work," *i.e.*, adorned with lotus flowers, like the Phœnician capital from Cyprus figured by Perrot. In Solomon's temple both the oracle and the outer cella had folding doors. In the second and third temples the inner door was replaced by a veil (*pārōkheth*), and a veil also hung before the outer door, (Mal. i. 10; 1 Mac. i. 22, iv. 51; *B. J.*, v. 5, § 4 *seq.*) The Chronicler (2 Chron. iii. 14) introduces a veil in the first temple. This feature also seems to be common to the temple with other Semitic shrines (comp. *C.I.S.*, No. 86, פרכם Assyr. *parakku*, Syriac *prakkē*, "shrines," and the Kaaba at Mecca).

The first temple of Zerubbabel resembled other temples of antiquity in being built to contain a visible symbol of the presence of the deity, namely, the ark, which stood in the inner chamber. In the second temple the adytum was empty, but the idea that the Godhead was locally present in it still found expression in the continuance of the altar service, in the table of showbread (a sort of continual *lectisternium*) that stood in the outer chamber, and above all in the annual ritual of the day of atonement, when the high priest entered the Holy of Holies to sprinkle the blood of the expiatory sacrifice on behalf of the people. Not only in this point but in all others the ritual of the second temple was dominated by the idea of priestly mediation, and the stated sacrifices of the priests on behalf of the people, which replaced the old stated oblations of the kings, became the main feature of the altar service. The first temple was primarily the royal chapel, and the kings did as they pleased in it; the second temple was the sanctuary of the priests, whose chief now became the temporal as well as the spiritual head of the people. In the time of Ezekiel not only laymen but uncircumcised foreigners entered the sanctuary and acted as servants in the sacred offices (Ezek. xliv. 7); in the second temple the laity were anxiously kept at a distance from the holy things, and even part of the court around the altar was fenced off by a barrier, which only the priests were allowed to cross (Joseph., *Ant.*, xiii. 13, § 5). Being no longer hemmed in by the royal buildings, as the first temple had been (Ezek. xliii. 8), its precincts could be expanded to suit the necessities of the enormous host of ministers of various ranks demanded by the growing complexity of the ritual, which, in matters of music and the like, was immensely developed as time went on (comp. PSALMS).

In the eighteenth year of his reign (20–19 B.C.) Herod the Great began to rebuild the temple and its precincts from the foundation, doubling the old area (*Ant.*, xv. 11; *Bell. Jud.*, i. 21). The works included the reconstruction, on the old site, of the Baris, which now received the name of Antonia, and is generally reckoned by Josephus as forming part of the temple precincts. Apart from the Antonia, the temple area formed a quadrangular plateau supported by retaining walls of great height and strength, and surrounded by porticoes. Three of the porticoes were double walks, thirty cubits broad, with monolith pillars twenty-five cubits high, and cedar roofs; the fourth or southern portico (the Stoa Basilica) had four rows of Corinthian pillars and three walks, respectively thirty, forty-five, and thirty cubits in breadth. The middle walk was twice the height of the aisles, and the latter were fifty feet high. As regards the size of this inclosure, we are told by Josephus that the Stoa Basilica was a stadium or 600 feet long (*Ant.*, xv. 11, § 5); and the same length is assigned to the eastern colonnade, which was known as Solomon's Porch (comp. John x. 23; Acts iii. 11 and v. 12), because it, and it alone, rested on an ancient substructure held to be the work of Solomon. The whole circuit of the porticoes was therefore four stadia, or with the Antonia six stadia (*B. J.*, v. 5, § 2). The Antonia lay on the north side (*Ant.*, xv. 11, § 4) and communicated by stairs with the north and west porticoes at the northwest angle of the inclosure. The Antonia, the porticoes, and the space immediately within them (the outer court, or, as modern writers call it, the court of the Gentiles) were not holy ground. But in the middle of the inclosure there was a platform raised fifteen cubits above the court of the Gentiles and fenced off by a barrier, with inscriptions, one of which still exists, forbidding aliens to pass on pain of death. The platform was approached by steps on all sides but the west, and was surrounded by a wall, rising twenty-five cubits above the inner level, and pierced by four gates on the north side and as many on the south. On the west there was no gate, but on the east—that is, in front of the fane—there were two, one within the other; for the eastern end of the platform was walled off to form a separate court for the women, at a somewhat lower level. One of the northern and one of the southern gates belonged to the court of the women, but it was also entered directly from the east by a very splendid gate of Corinthian brass, much more costly than the others, though they were overlaid with silver and gold. An enormous gate, forty cubits wide and fifty high (gate Nicanor), connected the women's court with the higher part of the platform, or court of the men of Israel. The beautiful gate of Acts iii. 2 is variously identified with the first or second of these eastern portals. The walls of the platform were lined within with chambers, in front of which ran a splendid colonnade; and the gateways were connected with the colonnade by small lofty halls (*exedræ*), which from without had a tower-like aspect. For the ground plan of the Holy Place and the Holy of Holies the ancient dimensions of Solomon's temple were preserved, and the external size demanded by the scale of the surroundings was gained by increasing their height, placing a lofty second story above them, making their walls and those of the surrounding chambers (corresponding to the chambers in the first temple) enormously thick, and placing at the front or east end a porch 100 cubits wide and 100 cubits high. The open doorway of this porch was overlaid with gold, as was also the door of the fane and the wall round it. To the ornament of the entrance belonged also a golden vine with clusters of grapes as big as a man. In front of the fane beneath the steps was the great altar of stone, fifty (or, according to the *Middoth*, thirty-two) cubits square and fifteen high; it was ascended by a flight of steps from the south. The part of the court round the fane and the altar was fenced off for the use of the priests, and other Israelites were admitted only when the sacrificial ritual required the presence of the sacrificer.

Herod's gigantic and costly structures were still in building, forty-six years after their commencement, when our Lord began his ministry (John ii. 20), and the works were not completed till the procuratorship of Albinus (62–64 A.D.). In 66 the great revolt against Rome broke out, and in August, 70, Jerusalem was taken by Titus and the temple perished in a great conflagration.

TEMPLE, THE, so-called because the Knights Templar had one of their branches in that part of London. It is a part of the city occupied exclusively by barristers and attorneys. It is the joint property of the two Inns of Court, known as the Society of the Inner Temple and of the Middle Temple, each of which possesses the right of calling properly qualified persons to the degree of barrister. This privilege is shared by the two other Inns of Court, known as Gray's Inn and Lincoln's Inn. The temple consists of a building occupied by lawyers, who rent the same from the societies. Much historical interest attaches to both the Inner and the Middle Temple. The Inns of Court, situated, as they are, in the center of the busiest district of London, are practically as secluded as the cloister of a cathedral. Thomson, Goldsmith, Addison, and Steele resided in the Temple; and, through the writings of Dickens and Thackeray, it has been identified with fictitious characters, who will live in history as long as the real ones whom we have already named.

TEMPLE, SIR WILLIAM, English statesman, diplomatist, and author, was born in London in 1628. He was first a pupil of his uncle, Doctor Hammond, after which he went to the grammar-school at Bishop Stortford, and then to the Puritan college of Emmanuel at Cambridge, where he came under the influence of Cudworth. At the commencement of the civil troubles his father embraced the popular cause and was deprived of his office. The accession of Charles II. rescued Temple, like many others, from obscurity. In 1660 he sat in the convention parliament at Dublin as member for Carlow, and he represented the same county along with his father in the regular parliament that followed. After a short visit to England in 1661, as commissioner from the Irish parliament, he finally removed thither in 1663. There he attached himself to Arlington, secretary of state, and two years later received his first employment abroad. It was in March, 1665, that the disastrous war with the United Netherlands began. Temple had for some time pressed on his government the necessity of stopping the French advance, and had pointed out the way to do so, but it was not till December, 1667, that he received instructions to act as he had suggested. He at once set out for The Hague, and, in January, 1668, a treaty was made between England and the United Netherlands, which, being joined shortly afterward by Sweden, became known as the Triple Alliance. It was a defensive treaty, made against the encroachments of France. In taking up a hostile attitude toward France, Charles' object had apparently been only to raise his price. Louis took the hint, increased his offers, and, two years later, the secret treaty of Dover reversed the policy of the Triple Alliance. Meanwhile Temple had developed the good understanding with the Dutch by contracting a commercial treaty with them (February, 1668), and had acted as English plenipotentiary at Aix-la-Chapelle, where peace between France and Spain was made in May, 1668. Shortly afterward he was appointed ambassador at The Hague.

The treaty of Dover led to Temple's recall; but the plot was not yet ripe, and Temple nominally held his post for another year. He perceived, however, that his day was over and retired to his house at Sheen. In June, 1671, he received his formal dismissal. The war with the Netherlands broke out next year, and was almost as discreditable to England as that of 1665. Want of success and the growing strength of the opposition in parliament forced Charles to make peace, and Temple was brought out of his retirement to carry through the change of front. After a negotiation of three days, carried on through the medium of the Spanish embassador, the treaty of Westminster was made (February, 1674). As a recognition of his services Temple was now offered the embassy to Spain. This he declined, as well as the offer of a far more important post, that of secretary of state, but accepted instead a renewal of his embassy to The Hague, whither he went in July, 1674. In the summer of 1677 Temple was summoned to England and received a second offer of the secretaryship of state, which he again declined. Louis still remaining obstinate in his demand, Temple was commissioned in July, 1678, to make an alliance with the states, with the object of compelling France to come to terms. This treaty was instrumental in bringing about the general pacification which was concluded in January, 1679.

This was Temple's last appearance in the field of diplomacy; but his public life was not yet over. In 1680 he was nominated ambassador to Spain, but stayed in England in order to take his seat in parliament as member for the university of Cambridge. He took no part in the debates on the great question of the day, and acting on the king's advice declined to sit in the parliament of 1681. When William III. came to the throne Temple was pressed to take office, but refused. His son became secretary at war, but committed suicide immediately afterward. Sir William, though occasionally consulted by the king, took no further part in public affairs, but occupied himself in literature, gardening, and other pursuits. Temple died at Moor Park, January 27, 1699.

Temple's literary works are mostly political, and are of considerable importance. Among them may be mentioned *An Essay on the Present State and Settlement of Ireland* (1668); *The Empire, Sweden*, etc., a survey of the different governments of Europe and their relations to England (1671); *Observations upon the United Provinces* (1672); *Essay upon the Original and Nature of Government* (1672); *Essay upon the Advancement of Trade in Ireland* (1673). Some of these were published in the first part of his *Miscellanea* (1679). In the same year, apparently, his *Poems* were privately printed. In 1683 he began to write his *Memoirs*. The first part, extending from 1665 to 1671, he destroyed unpublished; the second, from 1672 to 1679, was published without his authority in 1691; the third, from 1679 to 1681, was published by Swift in 1709. In 1692 he published the second part of his *Miscellanea*, containing among other subjects the essay *Upon the Ancient and Modern Learning*, which is remarkable only as having given rise to the famous controversy on the "Letters of Phalaris." His *Introduction to the History of England*, a short sketch of English history to 1087, was published in 1695. Several collections of his letters were published by Swift and others after his death.

TEMPLEMORE, a market town in the county of Tipperary, in the province of Munster, Ireland, supposed to take its name from a Commandery of the Knights Templars, is situated on the right bank of the river Suir, nine miles north of Thurles. Templemore has no manufactures of any importance, but possesses a considerable share of local traffic. It is a station on the great Southern and Western railway, seventy-nine miles from Dublin. The public buildings, although substantial, are not possessed of any noteworthy characteristics in architecture. The population in 1889 was 3,200, of whom upward of 2,400 were Roman Catholics.

TEMPO, the degree of rapidity with which a piece of music is to be executed. Some compositions require from their character a quick, lively movement, for others a slower movement is more suitable, and different terms are used to indicate different gradations of movement. Of these, the principal, beginning with the slowest, are: *Largo*, broad; *larghetto*, somewhat broad; *lento*, dragging; *grave*, heavy, solemn; *adagio*, slow; *andantino*, moving a little; *andante*, moving; *allegretto*, somewhat lively; *moderato*, moderately quick; *allegro*, lively; *vivace*, with vivacity; *presto*, rapidly; *prestissimo*, with great rapidity. These terms are not always used alone, but are modified often by either *allegro con brio*, lively and with briskness, *allegro appassionato*, passionately, excited.

TEMPO RUBATO (stolen time) is the name given to a mode of performance in which a rest is imparted by protracting one note beyond its proper duration and curtailing another, so that the aggregate duration of each measure remains unchanged.

TEMPORAL POWER (of the Pope) is a phrase susceptible of two meanings, which are very distinct from each other and the confusion of which has led to frequent and serious misunderstanding.

In one of these senses it means the sovereign power which the pope possessed as the ruler of the so-called Papal States, and which, especially of late years, has been the subject of much controversy. The power which the pope exercised within his own states, although modified in its exercise by his spiritual character, was in substance the same as that of any arbitrary sovereign, a power that is now extinct. By the second signification of the phrase "Temporal Power of the Pope" is understood, what would more properly be called the claim of the pope, in virtue of his office, to a power over the temporalities of other kings and states. This power may be of two kinds, directive and coercive. In the first sense it is a claim which no Catholic, consistently with his belief in the spiritual supremacy of the pontiff, can be supposed to deny, as it imports nothing more than that the pope, as supreme moral teacher, has power to instruct all members of his church, whether subjects or sovereigns, in the moral duties of their several states. If the power be regarded as coercive, it is necessary to distinguish the nature of the coercion which may be employed. That coercion may either consist in a threat or infliction of purely spiritual censures; or it may involve temporal consequences such as suspension or deprivation of office, forfeiture of the allegiance of subjects, and even liability to the punishment of death. Considered in the former sense the claim must be regarded as a natural consequence of the spiritual headship of the church, which is acknowledged by all Catholics; nor can it be denied that the power to compel sovereigns, by purely spiritual censures, to the fulfillment of the moral duties which their state imposes, is a natural concomitant of the spiritual primacy.

But the papal claim to authority over the temporalities of kings has gone far beyond these limits. From the tenth century downward popes have claimed and have repeatedly exercised a power of coercing kings, and punishing them when refractory by suspension, by deprivation, and by the transfer of the allegiance of their subjects to another sovereign. This well known claim has been a subject of controversy in the Roman Catholic Church between the Gallican and the Ultramontane schools, and in the Ultramontane school two different theories have been devised for its explanation. A third view of the temporal power and one which has found many defenders was propounded by the celebrated Fénelon. According to his theory the pope does not possess, whether by direct divine appointment or in virtue of the necessities of his spiritual office, any temporal power whatever. But he possesses a plenitude of that spiritual power which is required for the government of the church, and he is empowered to enforce it by spiritual penalties, and especially by excommunication or deprivation of membership of the church. Now, although excommunication and such other penalties, of their own nature are wholly spiritual, yet the religious sentiment of the mediæval period and the awe with which it regarded the authority of the church, invested these penalties with certain temporal effects. The history of most of the principal instances of the exercise of this power by the popes will be found detailed under the separate articles which refer to the particular popes or sovereigns who engaged in the contest of church and state.

TENACITY is that property of material bodies by which their parts resist a force employed to attempt to separate them. It is the result of the attractive forces exerted by the particles of matter upon one another through infinitesimally small spaces which are supposed to exist between them, hence it differs in different materials and even in the same material at different degrees of temperature. Forging and wire drawing increase the tenacity of metals in the longitudinal direction. Copper and iron have this property more than doubled, while gold and silver have it more than trebled by these metals being drawn into wire. Mixed metals have usually a greater tenacity than simple ones.

TENANT. See LANDLORD AND TENANT.

TENASSERIM, a division of the province of British Burmah, lying between 9° 30′ and 19° 30′ N. latitude and 95° 50′ and 99° 30′ E. longitude. It has an area of 46,730 square miles and comprises the seven districts of Moulmein town, Amherst, Tavoy, Mergui, Shwagyin, Toungoo, and Salwin, which formed the tract south of Pegu conquered from Burmah in 1826, and were for many years generally known as the Tenasserim provinces. The population of the division in 1881 was 825,741 (437,900 males and 387,841 females). By religion Hindus numbered 23,145, Mohammedans 24,786, Christians 28,315, Buddhists 698,304, and Nat worshipers 51,160. The cultivated area in 1885–86 was returned at 729,251 acres. The gross revenue in the same year was $900,000, of which the land-tax yielded $538,155.

TENBY, a municipal and parliamentary borough and watering-place of Pembrokeshire, South Wales, is finely situated on a long and narrow promontory of limestone rock, washed on three sides by the sea, on the west side of Carmarthen Bay, and on a branch of the South Wales railway, 10 miles east of Pembroke and 274 west of London (by rail). Its chief attractions as a watering-place are its picturesque appearance, its antiquarian remains, its equable and salubrious climate, and its wide stretch of firm sands. The fisheries of Tenby, for which the place was noted at a very early period, are still of importance. The trade of the port is inconsiderable. Steamers, however, ply to Bristol, Cardiff, Ilfracombe, and Weston-super-Mare. In the neighborhood there are extensive limestone quarries. The population of the municipal and parliamentary borough (area 640 acres) in 1871 was 3,810, and in 1881 it was 4,750. In summer it is augmented by more than a half.

TENCH, the *Tinca tinca* of naturalists, is one of the commonest and most widely spread freshwater fishes of Europe. It is generally distributed in all suitable localities throughout England, but is limited to a few lakes and ponds in the south of Scotland and in Ireland. As the tench is of comparatively uncommon occurrence in uninclosed waters, its place among the indigenous fishes of Great Britain has been denied, and it has been supposed to have been introduced from the Continent. In central Europe, however, where it is undoubtedly indigenous, it thrives best in inclosed, preserved waters, with a clayey or muddy bottom and with an abundant vegetation; it avoids clear waters with stony ground, and is altogether absent from rapid streams. The tench belongs to the family of carps (*Cyprinidæ*), and is distinguished from the other members of that family by its very small scales, which are deeply embedded in a thick skin, whose surface is as slippery as that of an eel. All the fins have a rounded outline; the short dorsal fin is without a spine, but the males possess a very thick and flattened outer ray in the ventral fins. The mouth is rather narrow and provided at each corner with a very small barbel. Tench if kept in suitable waters are extremely prolific, and as they grow within a few years to a weight of three or four pounds, and are then fit for the table, they may be profitably introduced into ponds which are already stocked with other fishes, such as carp and pike. They live on small animals or soft vegetable substances, which they root up from the ground.

TENDER. See PAYMENT.

TENDER, LEGAL, means the formal offer to perform some obligation incumbent on the person tendering. It is more frequently used in reference to the payment of money which is due. Whenever a tender of a debt is properly made, the legal consequence is that if the money is refused the creditor will have to pay the costs of any action he may bring to recover it, and cannot claim interest afterward. In case such an action is brought, the debtor has nothing to do but to plead that he duly tendered the money, and if he then pay into court the sum which he had formerly tendered, the other party must stop the action or continue it at his own risk. In order, however, that a tender have the above effect, it must have been duly made at the proper time and place, and must be in money and not by bill of exchange.

In the United States, national bank notes and treasury notes are legal tender for all debts, public or private, excepting customs duties and interest on public debt. Copper and nickel coin is legal tender for 25 cents. Silver coin of denomination of less than $1 is not legal tender for more than $5.

TENDON is a term employed in anatomy to designate the white fibrous tissue reaching from the end of a muscle to a bone or some other structure which is to serve as a fixed attachment for it, or which it is intended to move. In accordance with their form, tendons have been divided into the three following varieties: 1, Funicular, or rope like, as the long tendon of the biceps muscle of the arm; 2, Fascicular, as the short tendon of that member, and as the great majority of tendons generally; and 3, Aponeurotic or tendonous expansions, sometimes of considerable extent and serviceable in strengthening the walls of cavities, as, for example, the tendons of the abdominal muscles.

Tendons are frequently the seat of disease, among which inflammation requires special notice. Independently of gout and rheumatism the most frequent cause is a sprain or wrench in the neighborhood of a joint. These injuries are occasionally productive of long-continued, wearing pains, assuming much of a rheumatic character, and yield often, slowly and unwillingly to the remedies, both local and general, employed in rheumatism. Whitlows are sometimes the seat of a severe and often most destructive inflammation, which, though not confined to one finger, not infrequently extends to the hand and arm, attacking not only the tendons and softer parts but exposing the bone and disorganizing the joints.

Tendons are not infrequently the seat of syphilitic enlargement or tumors. Malignant tumors scarcely ever spring from tendons, but fibrous tumors and small cartilaginous enlargements are often found in tendons.

Rupture of the tendon is an accident, which is frequently caused by violent muscular action, especially, if from illness, or other causes, the muscles have been for some time in a state of inactivity. The long tendon of the *biceps cubiti* is very liable to this injury, which, in this case, is more often due to the disorganization caused by chronic rheumatic gout than to mere mechanical violence. The other tendons most frequently ruptured are the *tendon Achillis*, and the tendons of the *rectus femoris* and the *triceps humeri*. The essential points in the treatment of ruptured tendon is to keep the injured part in a state of constant rest and muscular relaxation, so that the separate ends may be approximated as much as possible and to prevent any violent extension till firm union, by the process of reparation, has been established. The special methods of treating individual cases are discussed in any special work on surgery.

TENERIFFE. See CANARY ISLANDS.

TENIERS, DAVID, the younger, a Flemish painter, almost ranking in celebrity with Rubens and Van Dyck, was born in Antwerp, December 15, 1610. His father David Teniers the elder (1582–1649), whose style he followed with a vastly superior power of conception, had been a pupil of Elsheimer in Rome and of Rubens in Antwerp. Admitted as a "master" in the guild of St. Luke in 1632, Teniers had even before this made the public acquainted with his works. The Berlin museum possesses a group of ladies and gentlemen dated 1630. Some really first-rate works—*The Prodigal Son* and a group of Topers in the Munich gallery, as well as a party of gentlemen and ladies at dinner, termed the *Five Senses*, in the Brussels museum—are remarkable instances of the perfection attained by the artist when he may be supposed to have been scarcely twenty. He was little over thirty when the Antwerp guild of St. George enabled him to paint the marvelous picture which ultimately found its way to the Hermitage Gallery in St Petersburg—the *Jubilee Meeting of the Civic Guards*, in honor of their old commander, Godfrey Sneyders. Correct to the minutest detail, yet striking in effect, the scene, under the rays of a glorious sunshine, displays an astonishing amount of acquired knowledge and natural good taste. This painting leads us to mention another work of the same year (1643), now in the National Gallery, London (No. 952), an equally beautiful repetition of which, dated 1646, belongs to the duke of Bedford.

Teniers died in Brussels April 25, 1690. A picture in the Munich gallery (No. 906), dated 1680, represents him as an alchemist, oppressed with a burden of age beyond his years. From this date we hear more of his doings as a picture-dealer than as a painter, which most probably gave birth to the legend of his having given himself out as deceased in order to get higher prices for his works.

TENIMBER. See TIMOR LAUT.

TENISON, THOMAS, archbishop of Canterbury, was born September 29, 1636. He was educated at the free-school, Norwich, whence he entered Corpus Christi College, Cambridge, as a scholar on Archbishop Parker's foundation. He graduated B.A. in 1657, M.A. in 1660, was chosen fellow in 1662, and became B.D. in 1667. For a short time he studied medicine, but in 1659 was privately ordained. In 1667 he was presented to the living of Holywell-cum-Needingworth, Huntingdonshire, by the earl of Manchester, to whose son he had been tutor, and in 1670 to that of St. Peter's Mancroft, Norwich. In 1680 he received the degree of D.D., and was presented by Charles II. to the important cure of St. Martin's-in-the-Fields. Under William, Tenison was in 1689 named a member of the ecclesiastical commission appointed to prepare matters toward a reconciliation of the Dissenters, the revision of the liturgy being specially intrusted to him.

The general liberality of Tenison's religious views commended him to the favor of William, and, after being made bishop of Lincoln in 1691, he was promoted to the primacy in December, 1694. He attended Mary during her last illness and with Burnet he attended William on his deathbed, and it was from their hands that he received the Eucharist. He crowned Queen Anne, but during her reign was not in much favor at court. He was a commissioner for the Union in 1706. A strong supporter of the Hanoverian succession, he was one of the three officers of state to whom on the death of Anne was intrusted the duty of appointing a regent till the arrival of George I., whom he crowned October 31, 1714. Tenison died at London December 14th of the following year.

TENNANT, WILLIAM, author of *Anster Fair*, was born in 1784 at Anstruther in Fifeshire, the birthplace of two other contemporary Scottish worthies, Thomas Chalmers and John Goodsir. *Anster Fair*, a fantastic poem in *ottava rima*, amazingly fluent, brimming over with high spirits, rich almost to excess in diction and fanciful imagery, was written by Tennant in 1811. Its publication, in 1812, brought the poet into notice, and employment was found for him as schoolmaster of the parish of Dunino, near St. Andrews. Tennant never fulfilled the promise of his first poem, which reads as if it had been dashed off in a fit of careless and happy inspiration, and never flags in its humorous glee from the first stanza to the last. *The Thane of Fife* (1822), in which he essayed the same vein, fell flat. A third poem, in the Scotch dialect, *Papistry Stormed* (1827), though full of the most spirited description, was also in a vein of humor that found few sympathizers. He wrote also two historical dramas, *Cardinal Beaton* (1823) and *John Baliol* (1825). His last published work was a series of *Hebrew Dramas* (1845), founded on incidents in Bible history. He died near Dollar, February 15, 1848.

TENNENT, Sir James Emerson, English politician and traveler, the third son of William Emerson, a merchant of Belfast, was born there April 7th, 1794. He was educated at Trinity College, Dublin, of which he became LL.D. He published a *Picture of Greece* (1826), *Letters from the Ægean* (1829), and a *History of Modern Greece* (1830). He entered parliament in 1832 as a member from Belfast. In 1841 he became secretary to the India Board, and in 1845 he was knighted and appointed colonial secretary of Ceylon, where he remained till 1850. The result of his residence there appeared in *Christianity in Ceylon* (1850) and *Ceylon, Physical, Historical, and Topographical* (2 vols., 1859). He died in London August 6th, 1869.

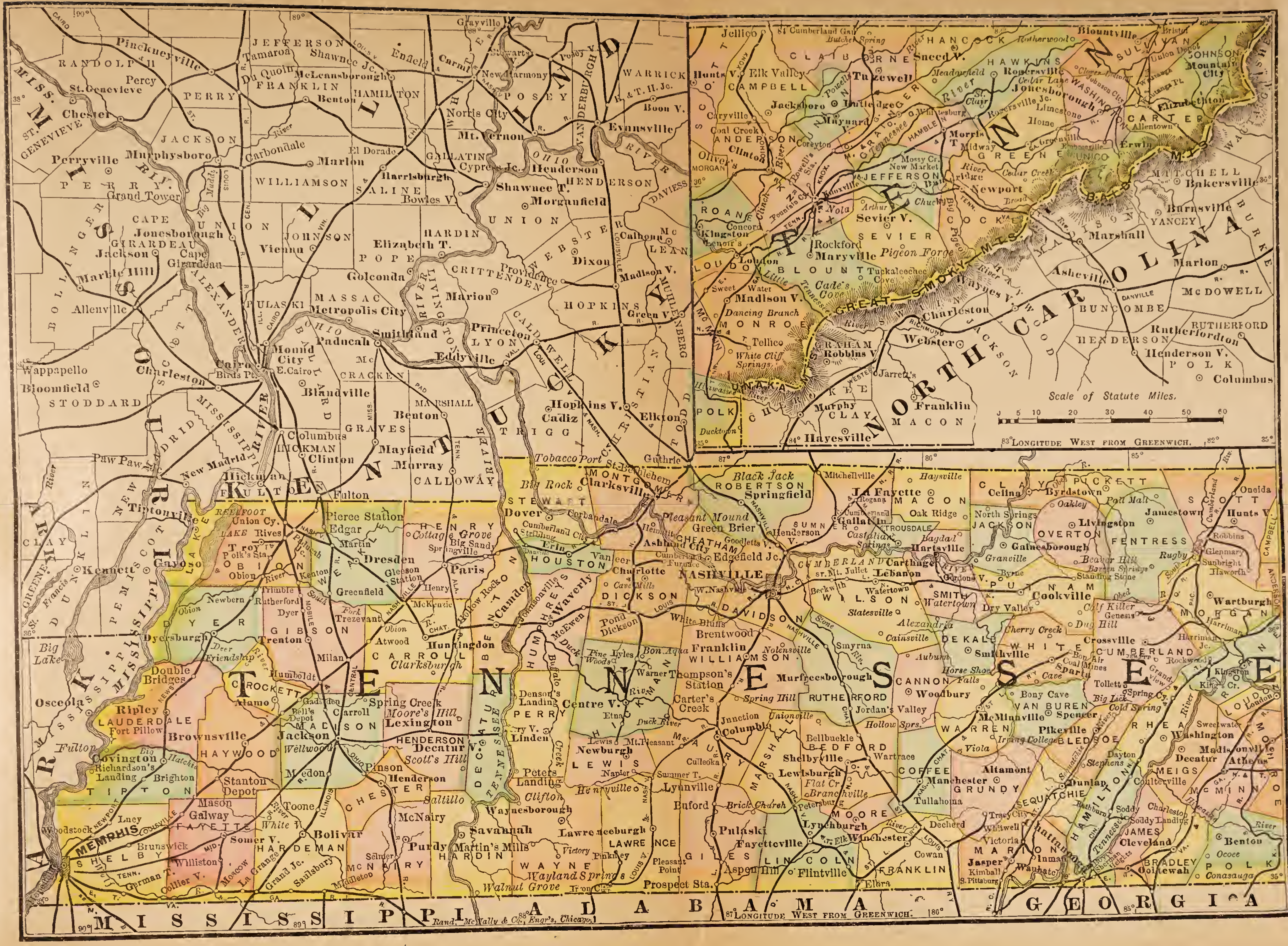
TENNESSEE, one of the United States of North America, the third added (June, 1796) to the original thirteen, its predecessors having been Vermont (1791) and Kentucky (1792). Tennessee is bounded on the east by the Unaka Mountains, which divide it from North Carolina, on the south by the line of 35° N. latitude, dividing it from Georgia, Alabama, and Mississippi; on the west by the Mississippi river, dividing it from Arkansas and Missouri; and on the north by a line which erroneous surveys have caused to vary greatly from the intended boundary—the line of latitude 36° 30′ N.—the variations all being measured to the north of that parallel. The actual boundary commences at the northeast corner of the State seven miles north of 36° 30′, and continues at that distance as far as the frontier of Virginia and Kentucky, where it diminishes to five miles; thence to about its intersection with 86° 30′ W. it increases to eleven miles; thence a deflection southward to a point about two miles from the Cumberland reduces it to ten miles; there it suddenly shoots north again to twelve miles, which distance is increased to twelve and one-half by the time it strikes the Tennessee; on the other side of that river it becomes very nearly coincident with the normal 36° 30′; and to that line it adheres with very slight aberrations until it strikes the Mississippi. The eastern boundary has one deviation from the stipulated line: it runs along the culminating ridge of the Unakas till within twenty-six miles of the Georgia frontier, when it turns due south, giving to Tennessee a triangular piece of territory which should belong to North Carolina. The area of the State is 41,750 square miles. Its extreme length is 432 miles and its width 109.

Commencing at the eastern frontier, the State of Tennessee is divided into several districts, having distinct characteristics and separated by well-marked natural boundaries, whose general direction from northeast to southwest corresponds with the trend of the main valleys.

The mountain region of East Tennessee is a long narrow belt of very irregular surface, comprised between the Unaka Range and a disjointed chain of lower mountains, the principal of which are called the Chilhowee Range, and the whole of which may be considered as constituting the secondary mountain system of the State. The intervening space is occupied by broken masses forming hills, mountains, and valleys, some parallel to the principal ranges, some crossing the space at right angles to them. This region varies in width from twenty-eight miles to about seven. All the rocks of this region and the next to it belong to what constitute in England the Silurian and Cambrian systems, the former being found in the western and the latter in the eastern part of the district. The lowest of these, called in Tennessee the Ocoee group, is believed to be coeval with the Potsdam group of the American system—the Lower Silurian and perhaps the Upper Cambrian of the British Isles. It consists chiefly of slates and conglomerates, with the sandstones of the Chilhowee group above.

Rising in a steep elevation at from 800 to 1,200 feet above the average level of the eastern valley of the Tennessee is the plateau popularly called the Cumberland Mountain. This mass, superincumbent on the Silurian system, consists of four very distinctly marked formations—(i.) the Devonian black shale, (ii.) the Subcarboniferous silicious beds, (iii.) the Mountain Limestone, (iv.) the Coal measures. These can easily be distinguished one above another on the face of the eastern escarpment; but on the western side the first two extend in a wide plain far beyond the base of the plateau, constituting the fourth district. The Mountain Limestone is shaly at the bottom, and more solid at the top, where it abounds in silicious concretions. The Coal measures consist of thick slabs of sandstone and conglomerate with the seams of coal interstratified between them. In its southern portion the plateau is divided longitudinally by the narrow valley of the Sequatchie river, which cuts deep into the subjacent Silurian beds. The portion east of this valley, known as Walden's Ridge, has its strata much disturbed and tilted, conformably with the Silurian rocks below; the western portion, on the contrary, has all its strata nearly horizontal. This formation, averaging about forty miles in width, is divided by a stratum of conglomerate eighty feet thick into the upper and lower Coal-measures, the former of which are much the more productive, but cover a less area, large portions of it having been carried away by denudation. These coal-seams are believed to average an aggregate thickness of eight feet and to cover an area of 5,000 square miles. The Subcarboniferous area, the central basin, and the western valley of the Tennessee can best be considered together. They consist of the Subcarboniferous silicious beds, together with the basins formed by their erosion. On the western face of the Carboniferous belt the Mountain Limestone has been carried away with the harder rocks of the Coal measures above it, but the under-lying silicious beds have resisted all erosive forces and are spread out over an extended area on both sides of the Mississippi. In Tennessee they form a margin round the central basin and are styled by local geologists the "highland rim." They consist of two strata, a lower one distinguished by the absence of lime and iron, and an upper one which contains both these materials in abundance. Both members consist mainly of a peculiar gravel, formed of silicious concretions embedded in a stiff, retentive clay.

All the members of the Silurian period, except the three lowest, are represented in this valley, which has been formed by the erosive action of the rivers within its borders: its higher strata were carried off northward by the Cumberland and its tributaries, westward by the Duck, and southward by the Elk, the last two being tributaries of the Tennessee. A channel of erosion along the lower portion of the Duck river con-


TENNESSEE
KENTUCKY
ILLINOIS
MISSOURI
ARKANSAS
MISSISSIPPI
ALABAMA
GEORGIA
NORTH CAROLINA
NASHVILLE
MEMPHIS
Knoxville
Chattanooga
Jackson
Clarksville
Murfreesborough
Columbia
Franklin
Paducah
Cairo
Evansville
Asheville
GREAT SMOKY MTS.
Scale of Statute Miles.
5 10 20 30 40 50 60
LONGITUDE WEST FROM GREENWICH.
Rand, McNally & Co., Engr's, Chicago.

nects this valley with another much narrower—the western valley of the Tennessee—where again the Silurian beds have been reached by the removal of the Subcarboniferous formations above them. Again, south of the main basin, the portion drained by the Elk is nearly separated from the rest by a number of detached hills of the Subcarboniferous formation, marking the watershed which divides the headwaters of the Elk from those of the Duck. A little west of the Tennessee river the Paleozoic rocks disappear under the Cretaceous formations, and these in their turn are covered successively by the Tertiary, Quaternary, and recent formations. The tract of ground covered by these four formations constitutes the Mississippi slope of western Tennessee, all of whose rivers run westward and discharge into the Mississippi. The dip of the strata is very slight, and the surface inclines with a very gentle slope.

The Cumberland and the Tennessee are the principal channels of inland navigation, while the Mississippi, washing the whole western frontier of the State, is its outlet to the Gulf of Mexico. The headwaters and embouchure of the Cumberland are in Kentucky, but much the greater part of its navigable stream is in Tennessee. From its confluence with the Ohio, at Smithland, Ky., to Nashville, a distance of 200 miles, it is generally navigable for eight months in the year, and during high water it is sometimes accessible to light-draft steamboats more than 300 miles farther. The Tennessee rises in Virginia, crosses east Tennessee in a southwestern direction, and enters Alabama a little above Bridgeport; in that State it assumes successively a westerly and a northerly direction, and then reënters Tennessee and crosses the State northward to its confluence with the Ohio at Paducah, Ky. Its navigable waters are divided by obstructions into three portions—(1) from the mouth to Florence, Ala., 300 miles, where navigation is arrested by the Mussel shoals; (2) thence through Alabama, about 100 miles, when the river breaks through the Cumberland Mountain; and (3) from Chattanooga to Kingston, about 100 miles farther.

In 1880 the number of farms in Tennessee was 165,650, embracing 8,496,556 acres of improved land, valued at $206,749,837. The principal productions are Indian corn, wheat, oats, cotton, tobacco, potatoes, peanuts, and hay. In 1884 1,250,000 bushels of peanuts were produced, as against 800,000 in 1883. In recent years considerable attention has been given to the cultivation of fruit and vegetables.

The chief minerals found in the State are coal, iron, copper, zinc, lead, and manganese. Of coal the output was 494, 491 tons in 1880 and 1,100,000 tons in 1885; in the latter year there were also 268,400 tons of coke. The product in 1886 was 1,714,290 tons and in 1888 1,967,297 tons. In 1880 there were produced 89,933 tons of iron ore (326,040 tons in 1885), 153,880 pounds of copper ingots, and 792,621 cubic feet of marble and limestone. Of zinc 17,415 tons were produced in 1884. Besides the minerals already mentioned, Tennessee yields millstone grit, hydraulic rock, barytes, fire-clay, gold, and petroleum.

Since 1875 the manufacturing industries of the State have grown immensely. From 1880 to 1885 the number of establishments increased from 4,326 to 4,425, the capital invested from $20,092,845 to $40,763,650, and the value of the manufactured products from $37,074,886 to $75,216,211. In 1880 cotton was manufactured in the State to the value of $934,014 (in 1885 to $2,719,768), carriages and wagons $1,253,721, flour and grist mill products $10,784,804, foundry and machine-shop products $1,191,531, iron and steel $2,274,203, leather $2,051,087, lumber $4,015,310, and cottonseed oil, cotton seed, and cake to the value of $1,235,000. In 1888 there were nineteen woolen mills and twenty-three cotton mills in operation. The former secured 2,113,000 pounds of wool, giving employment to 879 hands. The cotton mills consumed 37,610 bales of cotton and employed 2,677 hands; and thirteen iron manufactories the same year employed 5,510 hands. The population of the State, which in 1860 was 1,109,801 and in 1870 1,258,520, was in 1880 1,542,359 (males 769,277, females 773,082). Of this last total 403,151 were negroes. In 1887 the total population was estimated to number about 1,600,000 giving a density of 42 inhabitants to the square mile as against 36.9 in 1880. In 1890 the population was announced as 1,767,518. The principal cities are Memphis, Nashville, Chattanooga, Knoxville, and Jackson, which see.

Considerable decline in the population of Memphis is accounted for by two epidemics of yellow fever in 1878 and 1879 (see MEMPHIS). Chattanooga is still increasing at a very rapid rate in consequence of the vast development of the mineral resources of east Tennessee. Knoxville is also growing from the same cause, but not so rapidly as Chattanooga.

Provision for common school education was made before the Civil War, but was limited to white children. A State bank was established for the purpose of regulating the currency, and a portion of its capital was reserved as a school fund; its profits were also to be used for school purposes. The fund on which interest is now paid is $2,512,500. Besides this, the proceeds of a tax of 15 per cent. on property and a poll tax of $1 per annum are applied to the same purpose. Moreover, each county has the power of imposing a school tax on its people, and many incorporate cities and towns add still further to it by special taxes within their limits. All children between six and twenty-one (eighteen until 1885) are entitled to free education in the public schools. In 1875 the school population numbered 426,612, of whom there were 199,058 pupils enrolled. In 1886 the corresponding figures were 609,028 and 373,877, and in 1887 623,450 and 383,537. Besides the common schools numerous private schools exist. Higher education is provided for in several institutions, such as Vanderbilt university (Methodist) at Nashville, the university of the South (Episcopalian) at Sewanee or Cumberland Mountain, the Southwestern Presbyterian university at Clarksville, and others; the university of Tennessee at Knoxville is supported by State grants, and is not under the direction of any one denomination. Many smaller establishments entitled universities exist in various parts of the State.

The State university has been completely reorganized and its facilities largely increased during the past two years.

Among the public charities are the schools for the blind and deaf and dumb. At the former 120 pupils and at the latter 115 pupils have matriculated since 1886.

The amount of the State debt January 1, 1888, including principal and interest, was $17,000,000. The State receipts for two years ending December 19, 1890, were $3,957,000, and the expenditures $3,877,234 for the same period. The rate of State tax in 1890 was 30 cents on the $100, the assessment being calculated at about one-fourth of the actual value. The assessed valuations of the State for 1890, including lands, town lots, and personal property, aggregated $347,508,105. The 2,606 miles of railroad and railroad property in the State was assessed at $34,989,707.

The legislative and executive functions of government are carried on by a governor, a State Senate, and a house of representatives, whose respective duties and prerogatives correspond almost exactly to those of the president, senate, and representatives of the United States. Both the senators (thirty-three) and the representatives (ninety-nine) are elected for two years. The president of the senate, who is elected by the senators, succeeds as governor in case of the death of the elected governor during his term of office. The governor has the power of veto on the Acts of the legislature. In case of its exercise, the Act is returned to the legislature, when, if it passes by a constitutional majority in both houses, it becomes a law in spite of the veto.

The judiciary administration is carried on by courts of four designations—the county criminal courts, the circuit courts, the chancery courts, and the supreme court of the State. The county courts consist of the magistrates, who assemble at the county seat four times a year to transact county business. They elect a chairman out of their own body, who by virtue of such election becomes the financial agent of the county. In counties large enough to justify it, a county judge is elected, who exercises criminal jurisdiction. There are fourteen circuit courts, each having jurisdiction in several counties; in these all common-law cases are adjudicated, except in those counties where there is a criminal judge. There are eleven chancery divisions, for each of which a chancellor is elected, who tries all cases in equity in his division. All these judges are elected for eight years. The judges of the supreme court, five in number, are elected by the people at large, but not more than two can be taken from any one of three divisions of the State, viz., the eastern, middle, and western. Their jurisdiction is purely appellate, they revise the decisions of the other courts, and their decisions are final, except where a question arises as to the interpretation of the United States constitution.

At the time of its first settlement and occupation by Europeans Tennessee was part of the territory granted to the colony of North Carolina by Charles II. It was then, however, a hypothetical claim, the boundaries of which were chiefly determined by 36° 30' and 35° N. latitude. The eastern boundary of North Carolina was the Atlantic Ocean; on the other side the western territory extended according to one theory to the Mississippi, according to another theory to the Pacific Ocean. When the English settlers began to cross the Appalachian chain, they found the French established on the Mississippi and its tributaries—the Ohio, the Tennessee, and the Cumberland. The Spanish claim of an indefinite extension of their possessions in Florida was also a constant menace to the advances of the earliest English colonists in the direction of South Carolina and Georgia. The most important effort of transmontane colonization by the British prior to 1760 was the establishment of Fort Loudon on the Little Tennessee river in 1756 or 1757. But in 1760 this post was captured by the Cherokees and its garrison massacred; and the same fate befell a number of colonists who had settled between Fort Chissel (on New River, Virginia) and Fort Loudon. Early in 1761 Colonel Grant completely routed the Cherokees and compelled their French and Spanish allies to withdraw to Louisiana and Georgia.

Eight years later the stream of emigration began to set westward, mainly by two routes, of which one led through Cumberland Gap to the valley of the Cumberland river, while the other followed the course of the Tennessee round the southern border of the Cumberland plateau into the western Tennessee valley. A body of emigrants from Virginia settled on the banks of the river Holston, in what is now Hawkins county, and formed the nucleus of a rapidly increasing colony, which was mainly recruited from Virginia and North Carolina.

When it was proposed to liquidate the debts incurred by both the States and the Federal Government for war expenses by the sale of public lands, an Act of Cession was passed in 1784 by the North Carolina legislature ceding their lands west of the mountains, including those of the Watauga settlers, to the Federal Government. But in the following year the North Carolina legislature repealed the Act of Cession, and the whole matter was thus indefinitely postponed. A second Act of Cession was passed in 1790, by which the defunct State of Franklin became part of the territory of the United States south of the Ohio, including what now constitutes Kentucky and Tennessee. The northern portion became a State, under the name of Kentucky, in 1792, and the southern portion took rank as the State of Tennessee in 1796, being received into the Union the same year. The settlement of middle Tennessee was much retarded so long as the path of access to it from east Tennessee was through Cumberland Gap and down the Ohio. The broader route round the south of the Cumberland plateau by the Tennessee river was too unsafe for general use on account of the powerful Indian tribes—the Creeks and the Cherokees. This obstacle was finally removed by General Jackson's crushing defeat of the Creeks in 1814, and a large cession of their territory.

The position of Tennessee during the Civil War was the same as that of the other Middle and Southern States. While secession was in agitation, it refused to secede; but when actual hostilities commenced it joined the Southern confederacy. Even then, however, west and middle Tennessee sympathized with the South, while eastern Tennessee sided with the North. Each division sent very large contingents to the army which it favored. A large portion of the State was, during the later years of the war, in the occupation of the Northern army, and many great battles were fought on its soil, notably those of Fort Donelson, Murfreesborough (Stone River), Franklin, and Nashville. Tennessee suffered more from the exhaustion attendant on the close of the war, and from the rigorous government which accompanied the period of reconstruction, than any other State except Virginia.

TENNIS. This is the oldest, perhaps, of all existing ball-games. Of the origin of tennis it is not possible to speak with certainty, but it may be confidently assumed that it sprang from some very simple sport. It first appeared in Europe in the Middle Ages, when we find it played in open courts, in the parks or ditches of the feudal castles of France and Italy. It was at first the pastime of kings and nobles, but afterward became popular with all classes. The French seem to have borrowed it from the Italians, and to have contributed some of its refinements; and the English took it from the French.

One of the first improvements in the game consisted in the building of closed courts, first with walls, then with walls and roof. It is still played in the open air in some places in France, and "pallone," a rude and violent variety of the game, is yet seen in Italy. There are twenty-seven courts in England and one in Dublin.

As now played, tennis in France is virtually the same as in England, though there are a few differences of detail. The court is rectangular. An inner wall runs round three sides, to the height of seven feet, from which a sloping roof, called the penthouse, reaches to the outer wall. The surrounding passage thus inclosed is seven feet wide. Opposite to the long penthouse is the main wall, in which there is at one point a projection called the *tambour*, which deflects the ball across the court. In the inner wall, below the penthouse, there are several openings, the one at the end, on the service side, being called the *dedans*, the others the *galleries*. At the further end of the court is the *grille*, a square opening adjacent to the main wall. Across the court, halfway between the two ends, is stretched a net three feet high in the middle and five feet at the sides. The game may be played by two or by three, or by four players, one against one, one against two, or two against two. At the commencement the players toss or "spin" a racket, to decide which shall serve first, calling "rough" (for the knotted side) or "smooth." The party which wins the "spin" has the choice of the service or the "first stroke," the latter term meaning the return of the service. The server then begins at the "dedans" end of the court, technically called the "service side," pitches the ball in the air, and strikes it with his racket so that it shall drop on the side penthouse or on the wall above it, and then from the penthouse upon the floor on the other side of the net (called the "hazard side"), within the "service court." If he fail to do this. a "fault" is called, or a "pass" if the ball has gone beyond the pass line. If he serves a second fault, his adversary scores a point, called a "stroke." A pass counts for nothing, but annuls a previous fault. It now becomes the duty of the adversary, called the "striker-out," to return the ball by striking it with his racket in such a manner that it shall pass back over the net to the service side. The server must now strike it again and return it to the hazard side; and the player who first returns the ball into the net or "out of court" (*i.e.*, to the roof, or above the play line on the walls) loses the stroke, which is scored to his antagonist. But, if a player fail or refuse to strike the ball in the air (a "volley") or on its first bound and before it touches the floor a second time, then, except on the hazard side beyond the service line, a "chase" is made or reckoned on the floor, according to the lines on or between which the ball has dropped the second time. This chase is a stroke in abeyance. When one has been made it is called by the marker, but does not affect the score until one of the players has scored forty, when they change sides, and the player who has allowed the chase to be made must then endeavor to win it, *i.e.*, to place the second bound of the ball returned by him better, *i.e.*, nearer to the end wall, than the point at which the chase was marked. As often as his adversary returns his stroke, he must again endeavor to do this, until he succeeds or fails. If he succeed, he scores the stroke; if not, it is scored to his adversary. If two chases have been made at any stage of the score, even at the beginning of a game, then the players must change sides and play for the chases, as above described. A player who succeeds in sending the ball into the grille, the dedans, or the last division of the gallery—called the "winning gallery"—on the hazard side, scores at all times a stroke.

TENNIS, LAWN. Lawn-tennis is a modern adaptation of the first principle of tennis, in the simplest form, to a ball-game played on grass with rackets. The balls are of india-rubber, hollow, and covered with white cloth. The rackets are lighter and broader than those used at tennis. The dimensions of the courts, the size and weight of the balls, the mode of scoring, and other details are given in the laws of the game. The only requisites for the game are the balls, rackets, net and posts, and a hard level surface of grass. It may be, and often is, played upon the surfaces of wood, asphalt, cement, gravel, or other substance. The grass requires constant mowing, rolling, and in dry weather watering, to keep it in order. In the winter months it should be sedulously weeded, sown where necessary, and swept and rolled whenever the weather permits.

The choice of sides depends upon a toss or spin of a racket, as in tennis. The winner chooses the service or the preferable side, as he pleases. The server begins the game by striking the ball with his racket so that it passes (without touching) over the net, which is hung across the court from the posts. The ball served must drop in the space which is diagonally opposite to him on the other side of the net—a space bounded by the net, the side line, the half-court line, and the service line. His adversary, called the "striker-out," must return the ball before it touches the ground a second time; and the server must similarly return it again; and so on, until one or other player fails to return it over the net so that it shall drop on the ground anywhere on the side of the net farthest from him, and within or upon any of the lines which bound that space, technically called his adversary's *court*. When one player thus fails, he loses a stroke, which the other is deemed to win, and it is added to the score of the latter. The score is kept as at tennis, but there are no chases.

Activity and condition have great value in lawn-tennis, though there is room for much skill in placing the ball in the corners with hard, low strokes, and in intercepting and returning the ball by the volley while in the air, before it reaches the ground. But in matches temper, endurance, and quickness of movement count for very much.

Lawn-tennis, in one form or another, has been played for many centuries out-of-doors. The present variety of the game was first introduced, in a form which was soon shown to be impracticable, about the year 1874. It was then taken up by the All England Club at Wimbledon, who in 1877 remodeled the size and shape of the court, and the laws, and altered the system of scoring to that which obtains in the parent game. Thereupon, with the consent of the M.C.C. at Lord's, who lent the authority of their name to the movement, the code of laws which now prevails, and has been occasionally amended only in a few details, was promulgated by the All England Club. Lawn-tennis, in the short time which has elapsed since its introduction, has achieved immense popularity. Prize-meetings are held annually at Bath, Cheltenham, Dublin, Edinburgh, Manchester, Liverpool, and many other places in the United Kingdom; the game is also played with as great enthusiasm in the United States, Canada, Australia, and India In all those countries prize-meetings are held and championships are instituted.

TENT. A tent is a portable habitation or place or shelter consisting in its simplest form of a covering of some textile substance stretched over a framework of cords and poles, or of wooden rods, and fastened tightly to the ground by pegs. Throughout the greater part of the interior of Asia the pastoral tribes have of necessity ever been dwellers in tents. Tents have also been used in all ages by armies in campaign. The ordinary family tent of the Arab nomads of modern times is a comparatively spacious ridged structure, averaging from twenty to twenty-five feet in length, but sometimes reaching as much as forty feet. The average height inside at the center is seven feet and at the sides five feet, and the cloths at the side are so attached that they can easily be removed, the sheltered end being always kept open. The *jourt* or tent of the Kirghiz of Central Asia is a very capacious and substantial structure.

In Western countries tents are used chiefly in military encampments, by travelers and explorers, and for temporary ceremonial occasions and public gatherings. The material of which they are composed is commonly a light linen canvas or navy duck; but for tents of small size stout cotton canvas is employed, being light, strong, elastic, and sufficiently waterproof. These tents vary in size from a low-pitched covering, under which a couple of men can with difficulty creep, up to spacious marquees, in which horticultural and agricultural shows are held, and which can accommodate thousands of persons.

The marquee is distinguished from the tent by being a ridged structure, devoted to show and social uses; but the humblest tent made—the *tente d'abri* or shelter tent of the French army—is also ridged in form. The *tente d'abri* affords sleeping accommodation for six men, and consists of a rope stretched over three low poles and fixed into the ground. The simplest, but at the same time the least convenient, of ordinary tents is the conical, consisting of a central pole with ropes and canvas radiating from it in an unbroken slope to the ground. This form, however, covers much ground in proportion to the accommodation it affords, as the space round the circumference is of little value. The counterpart of the conical is the pyramidal tent, the four equal sides sloping to the ground; and this form with a fall or sides makes the square tent, which is both convenient in shape and firm in structure. Small tents are also made, modified from the Arab form, with a central pole and two lower lateral poles. In the umbrella tent the roof is supported by a set of ribs which radiate from the pole, precisely as the ribs of an umbrella spread out from the stick. In the balloon expansion tents the use of tent pole, pegs, and ropes is entirely avoided, the canvas being supported by light ribs of elastic wood resting on the ground, and the structure is kept taut by hauling ropes descending from the apex and secured by a holdfast driven into the ground. The inventor claims that his tent possesses much greater stability and capacity than the ordinary army tent, that it is much more easily and expeditiously pitched and taken down, and that it is very much lighter. In the latter important respect he calculates that by the adoption of his pattern a regiment at present carrying eighty tents of the Indian service pattern would save no less than twenty tons of transport.

TEOCALLI (House of God) the name given to the temples of the Aborigines of Mexico, of which many still remain in a more or less perfect state. They were built in the form of four-sided pyramids, and consisted for the most part of two, three, or more stories of terraces, with the temple, properly so-called, placed on a platform on the summit. The largest and most celebrated is the pyramid of Cholula, measuring 1,440 feet each way, and 177 in height; it is much defaced and the temple on its top has been removed. The teocallis in Yucatan are in far better preservation. A palace and temple are sometimes found attached together, and in a few cases the buildings are arranged around a courtyard.

TEPLITZ, or Töplitz, one of the most frequented watering places in the north of Bohemia, is picturesquely situated about thirty miles south of Dresden, in the plain of the Biela, which separates the Erzgebirge from the Bohemian Mittelgebirge. The main interest of the little town centers in the bathing season, which reaches its height in August; and the arrangements for the convenience and amusement of visitors are very complete. There is a large curhaus, and numerous handsome bath-houses are situated both in Teplitz and in the immediately adjoining village of Schönau. The saline-alkaline springs of Teplitz, ten to twelve in number, ranging in temperature from 90° to 117° Fahr., are classed among what are called "indifferent" waters. Used until lately almost exclusively for bathing, they are prescribed for gout, rheumatism, and some scrofulous affections, and their reputed efficacy in alleviating the effects of gun-shot wounds has gained for Teplitz the soubriquet of "the warriors' bath." The presence of a bed of lignite in the neighborhood has encouraged the industrial development of Teplitz, which carries on manufactures of cotton and woolen goods, india-rubber, chemicals, hardware, etc. In 1880 the united population of Teplitz and Schönau was 16,750.

TERAMO, a town of Italy, capital of the province of Teramo (formerly Abruzzo Ulteriore I.) and an episcopal see, stands on the left bank of the Tordino, where it is joined by the Vezzola, twelve miles from the coast and 876 feet above sea-level. It is connected by a branch line with Giulianova on the railway from Ancona to Brindisi. There are manufactures of wool and silk, and of straw hats and pottery. The population of the town in 1881 was 8,634, with its suburbs 13,988 (commune, 20,309).

TERAPHIM (תרפים), a Hebrew word found only in the plural, which the Authorized Version sometimes simply transcribes. The etymology of the word is quite obscure (see Gesenius, *Thesaurus*, p. 1,519 *seq.*), but it appears that the teraphim were a kind of idols (Gen. xxxi. 30) with something of a human figure (1 Sam. xix. 13); and, though their use was condemned by the prophets (1 Sam. xv. 23; cp. 2 Kings xxiii. 24), they were long commonly used in popular worship, both domestic (1 Sam. xix. 13, in the house of David and Michal) and public, (Judges xviii.) They are associated with the ephod, which, in this connection, seems to mean a plated image, and Hosea speaks of ephod and teraphim as essential elements in the religious usages of northern Israel. Like the ephod, they were specially associated with divination, and in particular with the sacred lot (Zech. x. 2; Ezek. xxi. 21 [26]). From the last passage it appears that teraphim were used by the Babylonians, as well as by the Hebrews.

TERATOLOGY is a term used in physiology as synonymous with the "History of Monstrosities of Anomalous Formations." See Monsters.

TERBURG, Gerard, subject painter, was born in 1608 at Zwolle, in the province of Overyssel, Holland. He practiced for a time in Paris with much success, visited England, it is said, and then returned to Holland. He seems to have resided for a time in Haarlem; but he finally settled in Deventer, where he became a member of the town council, as which he appears in the portrait now in the gallery of The Hague. He died at Deventer in 1681.

TERCEIRA. See Azores.

TEREDO, a genus of Lamellibranchiate *Mollusca*, of the order *Isomya*, sub-order *Sinupallia*, family *Pholadacea* (see Mollusca). The animals included in this genus are commonly known as "ship-worms," and are notorious for the destruction which they cause in ships' timbers, the woodwork of harbors, and piles or other wood immersed for a long period in the sea. They inhabit long cylindrical holes, which they excavate in the wood, and usually occur in great numbers, crowded together so that often only a very thin film remains between the adjacent burrows. Each burrow is lined with a layer of calcareous substance secreted by the mollusc; this lining is not usually complete, but stops short a little distance from the inner end of the burrow, where the boring process continues to take place. In some burrows, however, the lining is complete, either because the animal has reached his full size or because some cause prevents it continuing its tunnel; in such cases the calcareous tube has a hemispherical termination. The burrows are usually driven in the direction of the grain of the wood, but not invariably so. When a knot or nail or the tube of a neighbor is reached, the course of the burrow is altered so as to bend round the obstruction. One burrow is never found to break into another.

The adult *Teredo*, when removed from its burrow and calcareous tube, is from a few inches to three feet in length, according to the species to which it belongs, and is cylindrical and worm-like in appearance. The anterior end, which lies at the bottom of the burrow, is somewhat enlarged and bears a pair of shells or valves, which are not connected by the usual ligament, but are widely separated dorsally. The valves are triangular in shape and very concave on the side which is in contact with the animal. In front their edges are widely separated, and the mantle tube, which is elsewhere closed, has here a slight median aperture, through which the short sucker-like foot can be protruded. The next portion of the body behind the shell-bearing part is naked, except for the shelly lining of the burrow, which is secreted by this part. Anteriorly this portion contains part of the body proper; posteriorly it forms a tube divided internally by a horizontal partition into two chambers. In the lower chamber are the elongated gill plates, which have the typical lamellibranchiate structure. In the upper chamber anteriorly is the rectum. A thick muscular ring terminates this region of the body, and bears two calcareous plates shaped like spades or battledores. The expanded parts of these plates are free and project backward; the handle is fixed in a deep socket or pit lined by epidermis. These calcareous plates are called pallets (Fr. *Palmules*). Behind the pallets the tubular body bifurcates, forming two siphons similar to those of other Lamellibranchs; the siphons can be contracted or expanded within wide limits of length. The principal organs of the body—stomach, heart, generative organs, and nephridia—are situated in the anterior part of the body, forming a visceral mass, which extends some distance behind the valves. The heart is above the intestine and not perforated by it. The two valves are connected by an anterior adductor muscle.

From its resemblance to *Pholas*, *Teredo* is placed by conchologists in the family *Pholadidæ*, among the *Isomya;* but it is still undecided which part of the body corresponds to the posterior adductor.

Species of *Teredo* occur in all seas. The animal was known to the ancients and is mentioned by Theophrastus, Pliny, and Ovid. In 1715 it is mentioned by Valisnieri, in 1720 by Deslandes. In 1733 great attention was drawn to it on account of the discovery that the wooden dykes of Holland were being rapidly destroyed by ship-worms, and that the country was in danger of inundation.

Jeffreys, in his *British Conchology*, gives the following species as British:—*Teredo norvegica*, Spengler; *T. navalis*, Linn.; *T. pedicellata*, Quatrefages; *T. megotara*, Hanley. *T. norvegica* occurs chiefly on the west coast of Great Britain. It occurs on all the western and southern coasts of Europe, from Christiania to the Black Sea, and is the species which causes so much damage to the Dutch embankments. The pallets of this species are small and forked, and the stalk is cylindrical. The tube is simple and not chambered at its narrow end. *T. pedicellata* was originally discovered by Quatrefages in the Bay of Los Passages on the north coast of Spain; it has also been found in the Channel Islands, at Toulon, in Provence, and in Algeria. In *T. megotara* the tube is simple and the pallets like those of *T. norvegica;* it occurs at Shetland and Wick, and also on the western shore of the Atlantic, where its range extends from Massachusetts to South Carolina. *T. malleolus*, Turton, and *T. bipinnata*, Turton, belong to the West Indies, but are often drifted in floating timber to the coast of Europe. Other occasional visitants to the British shores are *T. excavata*, *bipartita*, *spatha*, *fusticulus*, *cucullata*, and *fimbriata*. These were described by Gwyn Jeffreys in *Ann. and Mag. Nat. Hist.*, 1860. *T. fimbriata* is stated to be a native of Vancouver's Island. A kind of ship-worm, the *Nausitora dunlopei* of Perceval Wright, has been discovered in India, seventy miles from the sea, in a stream of perfectly fresh water, namely, the river Kumar, one of the branches of the Ganges. *T. corniformis*, Lam., is found burrowing in the husks of cocoa-nuts and other woody fruits floating in the tropical seas; its tubes are extremely crooked and contorted for want of space. Fossil wood and palm-fruits of Sheppey and Brabant are pierced in the same way.

Twenty-four fossil species have been recognized in the Lias and succeeding beds of Europe and the United States. The sub-genus *Teredina*, Lam., is a fossil of the Eocene of Great Britain and France

TEREK (Russ. *Terskaya oblast*), a Russian government of Caucasia, situated to the north of the main Causasus chain. It is bounded by Stavropol on the north, by the Caspian Sea and Daghestan on the east, by Tiflis and Kutais on the south, and by Tchernomorsk and Kuban on the west It has an area of 23,548 square miles.

The climate is continental. The mean annual temperatures are 49.6° Fahr. at Pyatigorsk (1,850 feet above the sea; January 39°, July 70°) and 47.7° at Vladikavkaz (2,230 feet; January 23°, July 69°), but frosts a few degrees below zero are not uncommon. The mountain slopes receive an abundance of rain (thirty-seven inches), but the steppes suffer much from drought (rainfall between ten and twenty inches). Nearly the whole of the government belongs to the drainage area of the Terek, but the northwest corner is watered by the upper tributaries of the Kuma. The Terek rises at the height of about 8,000 feet, in the glaciers of the Kazbek, on the southern slope of the main chain of the Caucasus, which it pierces by the Darial gorge to the south of Vladikavkaz, after having received several *dons* or streams (Res, Guzel, Fiag, Ar). In fifty-three miles it descends nearly 6,000 feet. The Old Terek is no longer navigable, the chief current being directed northward into the New Terek. Several canals made by the Cossacks supply water for the irrigation of the neighboring fields. Its chief tributaries are the Sunja on the right, and the Tcherekh, the Baksan, and the Malka, in its upper course, on the left. The population of the government in 1884 was 615,660; of 606,500 inhabitants returned in 1883, 238,230 were Little and Great Russians, 1,230 Georgians, 18,500 Armenians, 4,300 Germans, 2,570 Poles, 4,780 Jews, 23,630 Ossets, 194,480 Tchetchens and Ingushis, 72,160 Kabardians, 9,130 mountaineers of the Avarian stem, 25,360 Kumyks, 1,770 Tartars, 6,270 Nogais, 2,470 Kalmucks, and 1,620 Persians. Out of these 239,500 were reckoned as belonging to the Greek Orthodox Church, 336,460 were Musselmans, 17,730 Gregorian Armenians, and the remainder Protestants, Catholics, and Jews. Owing to the great fertility of the soil in the well-watered districts, agriculture is the chief occupation. In 1882 the crops, although below the average, yielded 967,000 quarters of grain, 268,000 bushels of potatoes, 6,750,000 gallons of wine, and tobacco to the value of $90,000. Cattle breeding is extensively carried on in the steppes, and there were in the same year 118,630 horses, 582, 800 cattle, 1,226,400 sheep; murrains, however, are frequent, and cause great loss. Manufactures occupy only 3,371 persons, and their yearly production hardly reaches $1,500,000 in value. Petty trades are rapidly spreading in the villages. Trade suffers from want of good roads. The military and other chief roads have an aggregate of only 1,300 miles. The exports are limited to grain, wine, cattle, and some raw produce.

TERENTIUS AFER, PUBLIUS, the comic poet, was born at Carthage, 195 B.C. He was a slave of a Roman senator, who educated him highly and finally freed him. His first play was the *Andria*, written in his twenty-seventh year. Its success made an introduction for its author to the most refined society of Rome. Six comedies are extant under the name of Terentius, which are, perhaps, all he produced. His plays have an educational value, as dividing with the works of Cicero and Cæsar the honor of being written in the purest Latin. He is supposed to have died in his thirty-sixth or thirty-seventh year.

TERESA, ST. See THERESA, ST.

TERLIZZI, a town of Italy, in the province of Bari, and twenty miles west from that town, stands in the midst of a fertile plain. It has a castle which at one time was very strong and occasionally resorted to by the emperor Frederick II. and afterward by the Aragonese sovereigns. The walls and towers of the town still remain, but the fosse has been turned into boulevards. Terlizzi has a considerable trade, chiefly in the wine and fruit of the district. The population of the town in 1881 was 20,442 (commune, 20,592).

TERM (from the Latin *terminus*) in English law is used in two senses, the idea common to both being that of a limited and certain period of time.

It denotes (or rather did denote) a fixed time during which the courts are open for legal proceedings. Terms in this sense affected only what used to be called the superior courts—that is, the Queen's Bench, Common Pleas, and Exchequer. Their origin is no doubt to be traced back to the legislation of the early Christian emperors, the principle being adopted in England through the influence of ecclesiastical judges, and still surviving in the universities and Inns of Court. Terms were regulated by many acts of parliament, the effect of which was to confine to a comparatively short period the time during which the courts could sit *in banco*. There were four terms, Hilary, Easter, Trinity, and Michaelmas, the average duration of each being about three weeks. All legislation on the subject previous to 1873 is now merely of historical interest, for by the judicature act of that year the division of the year into terms was abolished so far as related to the administration of justice.

It denotes the time during which an interest in an estate for life or for years is enjoyed, also the interest itself, because such an interest must determine at a definite time. If the interest be for life, it is an estate of freehold; if for years, only a personal interest in real estate, and so personalty, even though the length of the term may far exceed in duration any possible life estate. A term of years is of two kinds, the first that created by an ordinary lease reserving a rent, as of a house or a building lease; the second that created by a settlement or a will, usually without rent reserved, for the purpose of securing payment of money. Both kinds have been considerably affected by recent legislation. By 8 and 9 Vict. c. 112 the assignment of satisfied terms was rendered unnecessary. The Conveyancing Acts, 1881 and 1882, give power to enlarge the unexpired residue of a long term in certain cases into the fee simple.

In Scotland terms are the days at which rent or interest is payable. They are either legal or conventional; the legal are Whitsunday and Martinmas; the conventional are fixed by agreement between the parties. A recent Act. (44 and 45 Vict. c. 39) makes uniform the law as to removal terms in burghs.

TERMINI, or TERMINI IMERESE (*Thermæ Himerenses*), a town on the north coast of Sicily, at the mouth of a river of the same name, in the province of Palermo, and twenty-three miles east-southeast of that town. Termini is one of the busiest provincial towns of Sicily; the surrounding district being exceedingly fertile and the harbor good, there is a considerable export trade in grain, fruit, tartar, and other products. The macaroni of Termini is in high repute. The tunny and sardine fisheries are extensive, and there is a school of navigation. The warm saline springs (110° Fahr.), sung by Pindar, are still largely resorted to, there being a well-appointed bath establishment, founded by Ferdinand I. The population of the town in 1881 was 22,370, with its suburbs 22,733 (commune, 23,148).

TERMINUS, a Roman divinity, supposed to preside over public and private boundaries. Originally he appears to have been the same as Jupiter himself, but gradually he was recognized as a separate and distinct god. Hardly any religious conception is more thoroughly characteristic of the land-loving Romans than the conception of Terminus, whose worship was practiced down to a late period.

TERMITES. See ANT.

TERMONDE. See DENDERMONDE.

TERN (Norsk *Tærne*, *Tenne*, or *Tende;* Swedish *Tärna;* Dutch *Stern*), the name now applied generally to a group of sea-birds, the *Sterninæ* of modern ornithology, but, according to Selby, properly belonging, at least in the Farne Islands, to the species known by the book-name of Sandwich Tern, all the others being those called Sea-Swallows—a name still most commonly given to the whole group throughout Britain from their long wings, forked tail, and marine habit.

Setting aside those which are but occasional visitors to the British Islands, six species of Terns may be regarded as indigenous, though of them one has ceased from ordinarily breeding in the United Kingdom, while a second has become so rare and regularly appears in so few places that mention of them must for prudence sake be avoided. This last is the beautiful Roseate Tern, *Sterna dougalli;* the other is the Black Tern, *Hydrochelidon nigra*, belonging to a genus in which the toes are only half-webbed, of small size and dark leaden-gray plumage. It is without doubt the *Sterna* of Turner, and in former days was abundant in many parts of the fen country, to say nothing of other districts.

The Sandwich Tern, *S. sandvicensis* or *S. cantiaca* —named from the place of its discovery, though it has long since ceased to inhabit that neighborhood—is the largest of the British species, equaling in size the smaller Gulls, and having a dark-colored bill tipped with yellow, and dark legs. It was, however, never so abundant as its smaller congeners, the so-called Common and the Arctic Tern—two species that are so nearly alike as to be beyond discrimination on the wing by an ordinary observer, and even in the hand require a somewhat close examination. The former of these has the more southern range, and often affects inland situations, while the latter, though by no means limited to the Arctic circle, is widely distributed over the north and mostly resorts to the seacoast. Yet there are localities where, as on the Farne Islands, both meet and breed, without occupying stations apart. The minute diagnosis of these two species cannot be briefly given. The remaining native species is the lesser Tern, *S. minuta*, one of the smallest of the genus and readily to be distinguished by its permanently white forehead. All the species already mentioned, except the Black Tern, have much the same general coloration—the adults in summer plumage wearing a black cap and having the upper parts of the body and wings of a more or less pale gray, while they are mostly lighter beneath. They generally breed in association, often in the closest proximity—their nests, containing three eggs at most, being made on the shingle or among herbage. The young are hatched clothed in variegated down, and remain in the nest for some time. At this season the parents are almost regardless of human presence and expose themselves freely.

At least half-a-dozen other species have been recorded as occurring in British waters, and among them the Caspian Tern, *S. caspia*, which is one of the largest of the genus and of wide distribution, though not breeding nearer to the shores of England than on Sylt and its neighboring islands, which still afford lodging for a few pairs. Another, the Gull-billed Tern, *S. anglica*, has also been not infrequently shot in England. All these species are now recognized, though the contrary was once maintained, as inhabitants of North America, and many go much farther.

TERNATE, a small island in the East Indian Archipelago, off the west coast of JILOLO (*q. v.*), in 0° 48′ N. latitude and 127° 19′ E. longitude. It is nearly circular in form, with an area of about twenty five square miles, and consists almost entirely of a very remarkable volcano (5,600 feet) formed of three superimposed cones. Cocoa-nuts, sago, tobacco, cotton, sulphur, and saltpeter are the chief productions of the island. The clove, which had been extirpated by the early Dutch rulers to enhance its value by restricting its cultivation to the Banda Islands, Amboyna, etc., is beginning again to be grown, as also is the nutmeg. The inhabitants are nearly all Mohammedan Malays. The town of Ternate, with a population of about 9,000, is the seat of a native sultan and of a Dutch resident; the harbor is commanded by a fort. The residency, which includes a part of the eastern coast of Celebes (see CELEBES), the greater part of Jilolo, and numerous smaller islands, has an area of 26,900 square miles and a population estimated at about 290,000.

TERNI, a town of Italy, in the province of Perugia, is situated in the fertile valley of the Nera, between two branches of that river, about five miles below the point where it is joined by the Velino. It has a station, three-quarters of a mile off, on the railway line between Rome and Ancona, sixty-nine miles to the north of the former city and nineteen south by west from Spoleto. Terni manufactures leather and cloth, and has some trade in wine and silk. For the traveler its chief interest lies in its antiquities (remains of an amphitheatre of the time of Tiberius, a temple, a theater, baths, and numerous inscriptions) and in the proximity of the falls of Velino (*Cascate delle Marmore*). Alike in volume and in beauty these take a very high place among European waterfalls; the cataract has a total descent of about 650 feet, in three leaps of 65, 330, and 190 feet respectively. They owe their origin to M'. Curius Dentatus, who in 272 B.C. first opened an artificial channel by which the greater part of the Lacus Velinus in the valley below Reate was drained. The population of the town in 1881 was 9,415, with its suburbs 10,371 (commune, 15,853).

TERPANDER, a Lesbian poet and musician, settled in Sparta about the end of the Second Messenian War (668 B.C.) His innovations in music were considered to have inaugurated a new era of musical art in Greece; but we are very imperfectly informed as to their nature. Strabo says that he increased the number of strings in the lyre from four to seven; others take the fragment to mean that he developed the citharœdic nomos by making the divisions of the ode seven instead of four. We possess six short fragments of poetry in the Dorian dialect bearing the name of Terpander. They are from hymns to the gods Zeus, Apollo, Apollo and the Muses, the Dioscuri, etc., and are written in a slow spondiac movement or in dactyls. They present no remarkable features and are probably spurious.

TERPSICHORE, one of the nine Muses, presiding over choral song and dancing.

TERTIARY, a name given by the church writers to a class in the Roman Catholic church, who, without entering into the seclusion of a monastery, aspire to practice in ordinary life all the substantial obligations of the scheme of virtue supposed to be laid down in the Gospel. Whatever earlier traces of this institution may be observable, there is no dispute that it was under St. Francis and the mendicant orders generally that the institution of Tertiary, such as they have since substantially maintained were made public in 1221. The associates must, of course, all be members of the church, and it is moreover required that all shall be of good repute and blameless life. The intending members must restore all ill-gotten goods, must renounce all evil practices, and abandon all feuds and enmities with their neighhors. Wives cannot be received without the consent of their husbands. The obligation of Tertiary once accepted is irrevocable, unless the party should be released, or should enter into a more strict religious order. The members are required to renounce luxury of life, profane exercises and amusements, costly or unseemly dress, and the use of arms, except in the necessity of self defense. They must attend all religious services, avoid contention, litigation, and unnecessary oaths, cultivate charity toward all, with special obligations toward the needy, sick, or afflicted brethren, and practice with more than common fervor the great Christian virtues.

They are placed under the authority of superiors elected at intervals, and for a stated period, and are liable to an annual visitation, conducted by a priest appointed for the purpose. Similar lay associations were organized in connection with the Dominican, Carmelite, and Augustinian, as well as with certain of the more modern orders, and a brotherhood of the same order has recently been formed by the Templars. The Tertiary institute, properly so-called, is quite distinct from that of the "lay confraternities," which exist in connection with the several orders, and the objects of which are very similar.

TERRACINA, a town in Italy, in the province of Rome, and about sixty miles to the southeast of that city, at the southeast extremity of the Pontine marshes, where the Monti Lepini (see ITALY and LATIUM) descend into the sea. The modern town stands mainly on the level ground. The most conspicuous building is the cathedral, which is believed to occupy the site of a temple of Jupiter Anxurus; it is enriched both externally and internally with beautiful old columns and Roman mosaics. Above the town, on the summit of the cliff, are the remains of a palace of Theodoric (*c.* 500), afterwards a mediæval castle. Fishing is carried on, and there is some trade in the produce of the district. The population of the town in 1881 was 6,294 (commune, 8,572).

TERRA-COTTA. Strictly speaking the name is applicable to all objects made of baked clay, from the rudest brick to the finest piece of pottery, but it usually has a more limited meaning, to denote fictile objects which do not come under the head of pottery, such as statuettes and busts; and in its architectural use it specially implies the finer sorts of decorative clay-work to the exclusion of common building brick.

No branch of archæology has during the last dozen years or so developed so rapidly as that of Greek terracotta figures; on this most fascinating subject an astonishingly large mass of literature has been published in

Germany and France. The discovery of this new world of Greek art began practically in 1873, with the first excavations in the tombs of Tanagra, a Bœotian town on the high road from Athens to the north, which brought to light a number of very beautiful terra-cotta statuettes. Subsequent excavations at Corinth, Smyrna, Cyme, Tarentum, the Cyrenaica, and many other places also yielded a vast number of terra-cotta figures of various dates and styles. By far the greater number belong to the second half of the fourth century B.C.; but examples of an earlier date are not wanting, not only of figures in the round, but also of reliefs, which appear to have been largely used for the decoration of the flat surfaces of walls and friezes. The earliest of all date from a quite prehistoric period and are mostly small idol-like figures of the rudest possible form, having an almost shapeless trunk with stick-like projections for the limbs, and the breasts and eyes roughly indicated by round dots. They are usually decorated with coarse stripes or checks in ocher colors. Examples of these have been found at Hissarlik (Troad), in Cyprus and other islands, and in the citadel of Tiryns in 1884-85 by Doctor Schliemann and Doctor Dörpfeld. Comparatively few specimens exist of the best period of Greek art—the fifth century. A relief in the Louvre (about 18 by 12 inches) with a pierced background, dating from the first half of the fifth century, represents two female mourners at a sepulchral stele—one standing and the other seated; under the foot of the latter is inscribed **ΑΛΕΚΤΡ.** On the other side of the stele are two youths (the Dioscuri) standing by a horse. The whole design is simple, but very graceful, and the modeling is skillfully treated in very low relief.

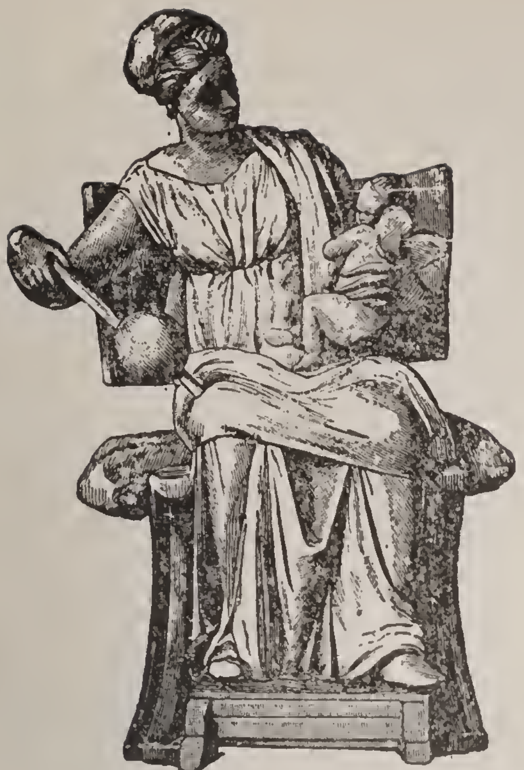
In most cases the terra-cotta figures and reliefs occur in or close by tombs, but it is only in comparatively rare instances that the subjects represented have any reference to death. Another large class have been found in the vicinity of temples, and are probably votive offerings, such as the small statuettes of horses from the acropolis of Athens, now in the Louvre. In other cases, as at Halicarnassus, great quantities of small figures were buried under a temple, probably to purify the site, as was done in Egypt under the later dynasties, when many hundred figures of bronze were sometimes buried under one building. The tombs of Tanagra have yielded by far the richest finds of these figures, the specimens being very remarkable for their beauty. These exquisite statuettes do not (in most cases) represent deities or heroic personages, but the homely everyday life of the Greeks, treated with great simplicity and evident realism. Several small figures from Myrina (Mysia) have the artist's name inscribed on them; but signatures of this sort are rare.

It is impossible to describe the many subjects treated. Only a few examples can be mentioned. Among single figures the most frequent are those of girls standing or seated in an immense variety of pose, and with plentiful drapery arranged in countless methods, showing the great taste with which a Greek lady could dispose the folds of her ample pallium, whether it hung in graceful loops or was wound closely round the figure or formed a hood-like veil over the head. In some the lady holds a leaf-shaped fan, or is looking in a circular mirror, or holds a ball ready for the game. Many have a strange broad hat, probably of straw, which does not fit on the head, but must have been fastened by a pin to the hair or veil. One very beautiful motive is that of a girl playing with an infant Eros, who flies to her for shelter, and is received with welcome half tinged with dread. A favorite subject is taken from a game in which one girl carries her playmate on her back—a motive which, though difficult to treat in sculpture, is managed very gracefully in terra-cotta. Other very lovely groups are Aphrodite suckling the baby Eros, or with more than one cupid hovering round her. A very beautiful example occurs in the South Kensington Museum (from the Castellani sale). It represents a half-nude figure of Aphrodite reclining on a couch, with two cupids behind holding up a veil, which was colored blue to form a background to the creamy white of Aphrodite's body.

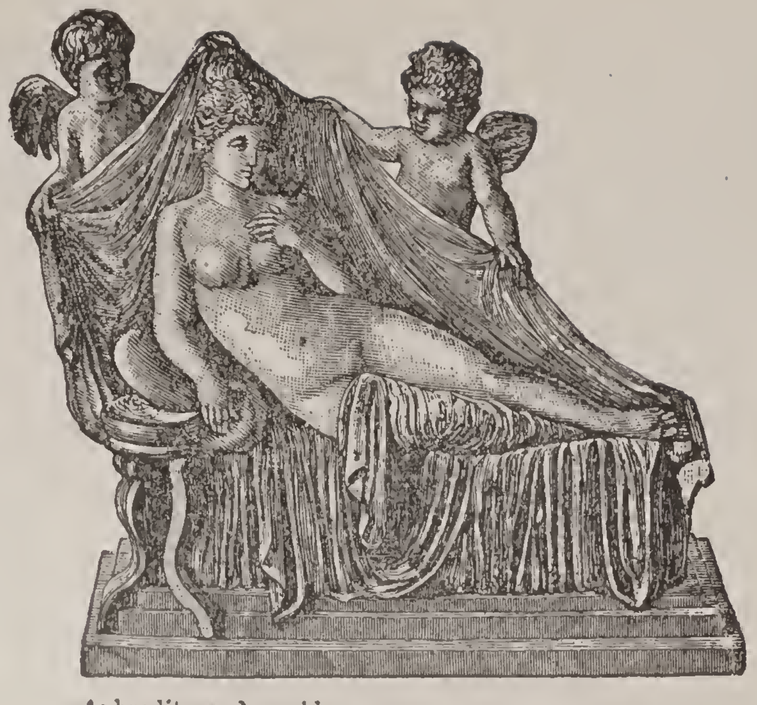
The Tanagra and other figures are all formed of thin pieces of soft clay pressed into a mold, usually formed in two halves and then stuck together; and they are made hollow so as not to warp and crack in the firing, and have a hole at the back for the escape of moisture during that process. The head is solid and was formed in a separate mold, as were also any accessories, such as fans or mirrors, and arms if they extend away from the body. After the whole was put together it was usually touched up and finished with modeling tools. The color was applied after baking: a coating of creamy white lime or chalk all over served as the flesh tint and also as a good ground for the other colors. The hair of the females is always of a rich auburn red, such as the Venetians were so fond of painting in the sixteenth century; blue was touched on the eyes and crimson on the lips. Drapery, if not white, was usually rose-color or blue, often with a fringe or bands of gold on the border. Necklaces, earrings, and other ornaments were generally gilt, the gold leaf being applied over a slightly raised surface of slip, as on the Greek vases. Similar examples have been found in tombs at Thebes, at Thespiæ, and round Athens. A number of places in the west of Asia Minor have yielded large quantities of terra-cotta figures, very similar in size and technique to those of Tanagra, but belonging for the most part to quite a different school of sculpture. Unlike the Tanagra figures, which are rather pictorial in style and deal with *genre* subjects, those from Smyrna, Cyme, Myrina, and other places in Asia Minor are thoroughly sculpturesque in design, and are frequently miniature reproductions of large statues or groups. One instance is the fine nude figure of Eros as a youth leaning against a cippus, holding a bronze arrow in his hand, in the collection of M. de Branteghem, now in Rome. The whole of it was gilt, which was frequently the case with the Asia Minor statuettes, but rarely so in those of Tanagra.

A very different class of statuettes has recently come to light in the Cyrenaica, on the northern coast of Africa. Many of these are nude female dancers wearing an elaborate stephanos-like head-dress. They are realistic in modeling, and very ungraceful in pose—a striking contrast to the exquisite taste of the Tanagra and most of the Asia Minor figures. Recent excavations in the tombs of Corinth have produced a large number of fine terra-cottas, ranging in date over a very long period. Another and artistically very perfect class of figures is being dug up from among the tombs of Tarentum. Some of these belong to the finest period of Greek art, probably about 400 B.C., and others are even earlier. Many are not statuettes, but merely small busts of heroic style, and of the highest sculpturesque beauty. They are certainly not portraits, and do not appear to represent deities. In addition to statuettes and reliefs, terra-cotta was used by the Greeks for various minor ornamental purposes. Delicately molded necklaces and pendants for ears were stamped out in clay and then thickly covered with gold leaf; this produced a very rich effect at a small cost; many fine examples are preserved in the Louvre. On a larger scale terra-cotta was adapted by the Greeks to important architectural ornamentation. Many fine examples have been found at Olympia and among the ruined temples of Selinus. In some cases the main cornices of the building were

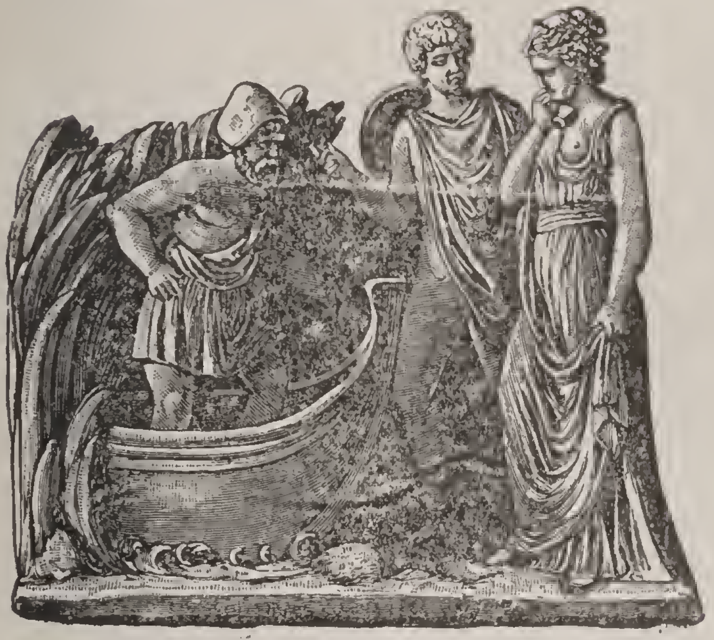
TERRA-COTTA.



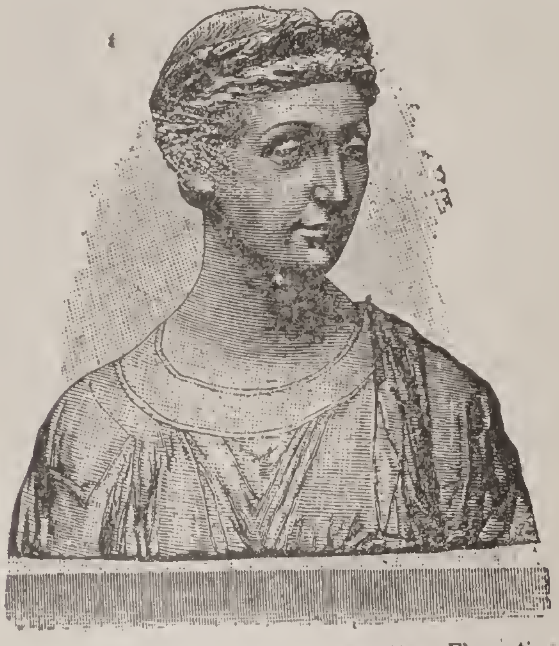
—Statuette of a girl and infant Eros from Tanagra. (St Petersburg.)



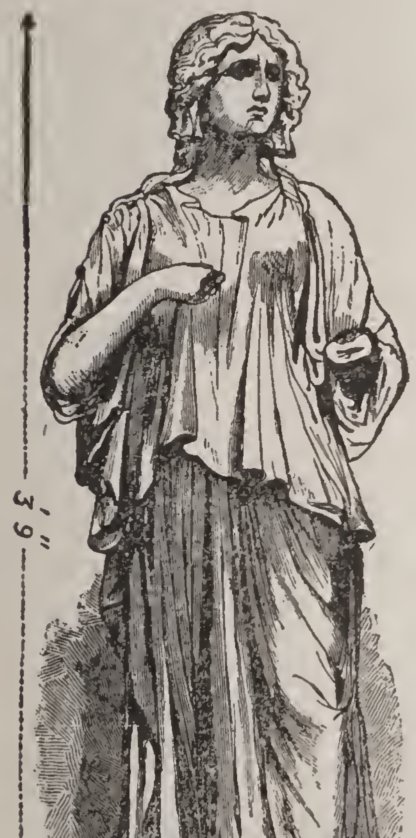
—Aphrodite and cupids. (South Kensington Museum.)



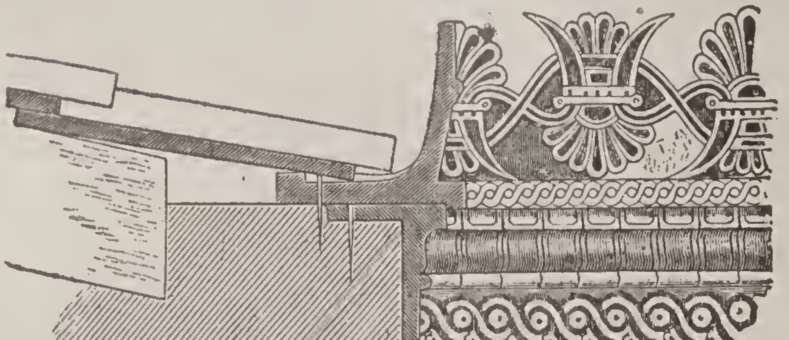
—A soul about to enter Charon's bark. (Prince Liechtenstein's collection, Vienna; formerly in the Lecuyer collection.)



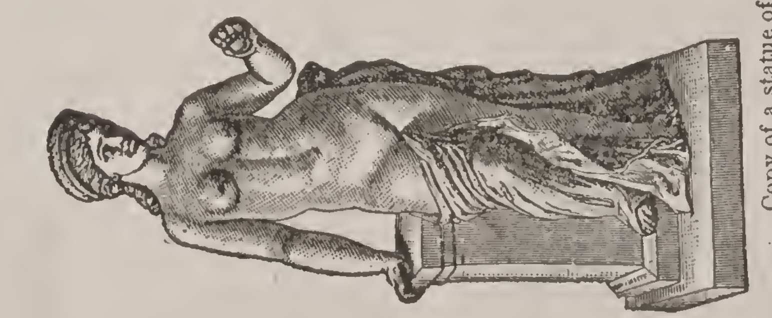
—Portrait bust in terra-cotta: Florentine work of the middle of the 15th century. (South Kensington Museum.)



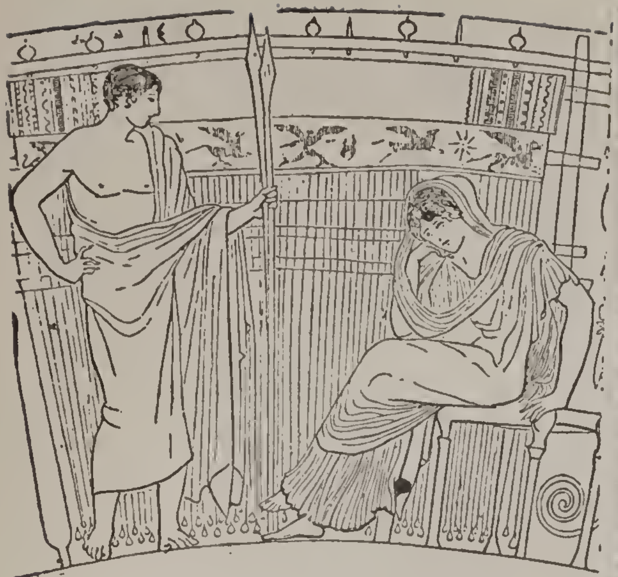
:—Terra-cotta statue of the Muse Urania, 1st century A.D. (British Museum.)



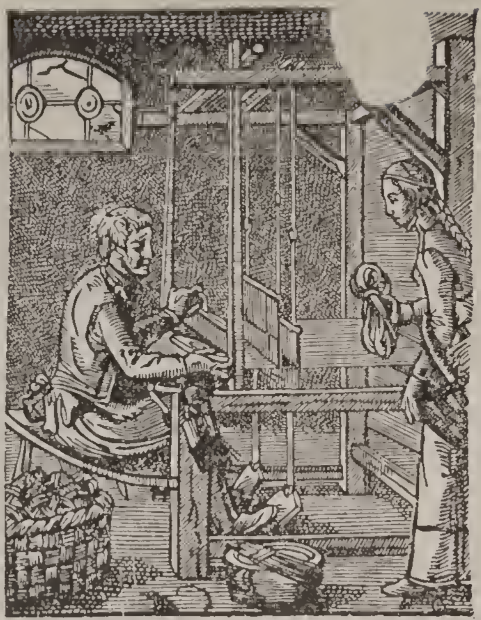
—Cornice enrichments of painted terra-cotta from Selinus. This section shows the careful way in which the terra-cotta is fitted on to the stone; the colours are red and brown ochre and cream-white.



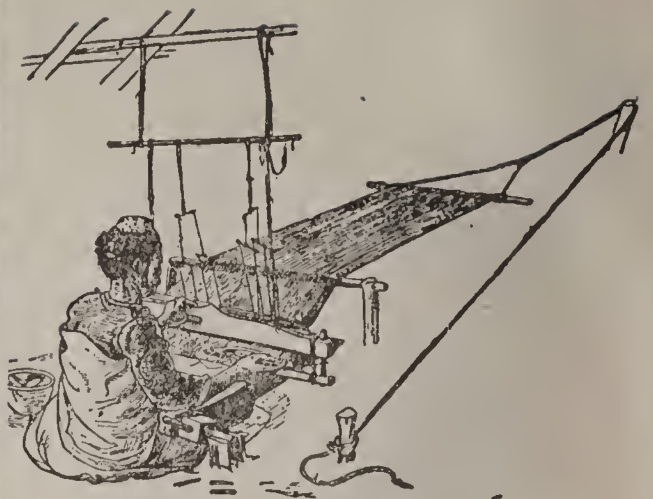
:—Copy of a statue of Aphrodite from Megara (Berlin Museum.)



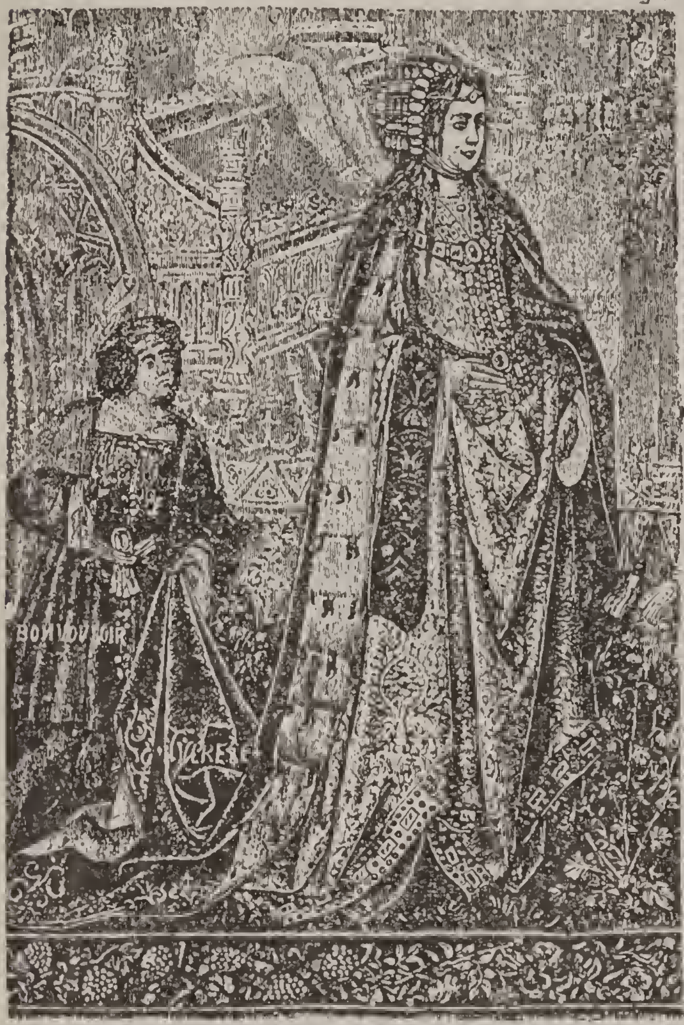
—Penelope's loom, from a Greek vase of the 5th century
:—The standing figure is that of Telemachus.



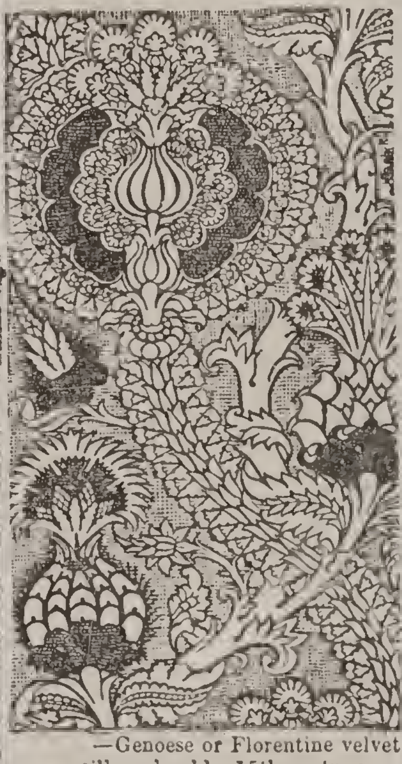
—Mediæval low-warp loom, from a cu
by Jost Amman; middle of the 16th century.



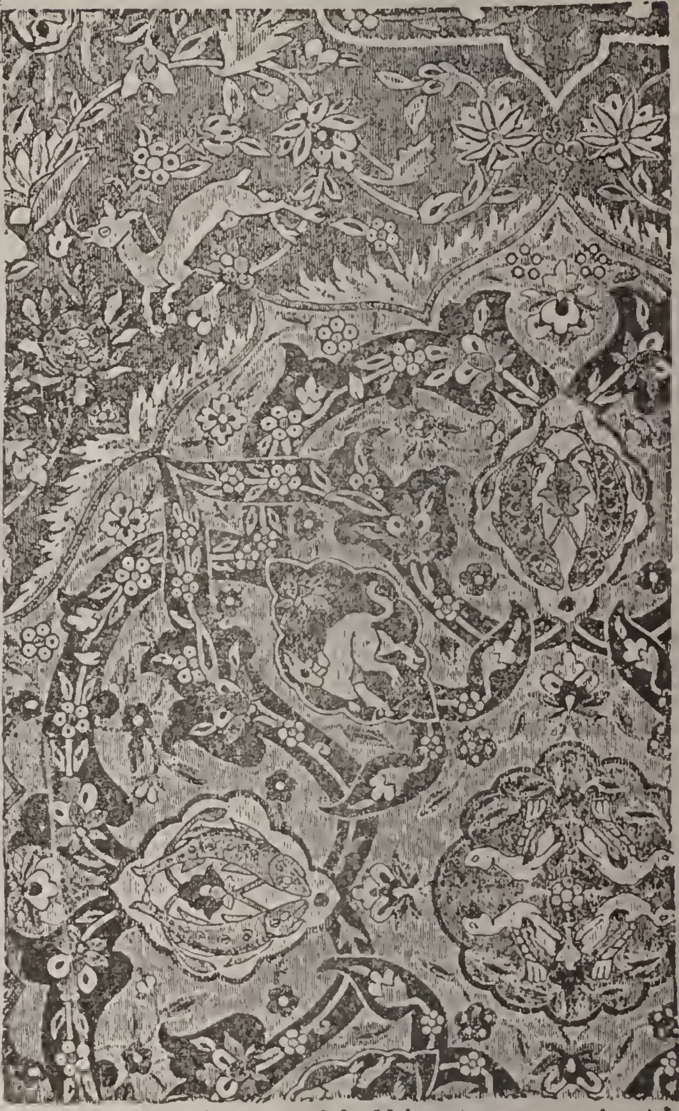
Indian hill loom, as still used.



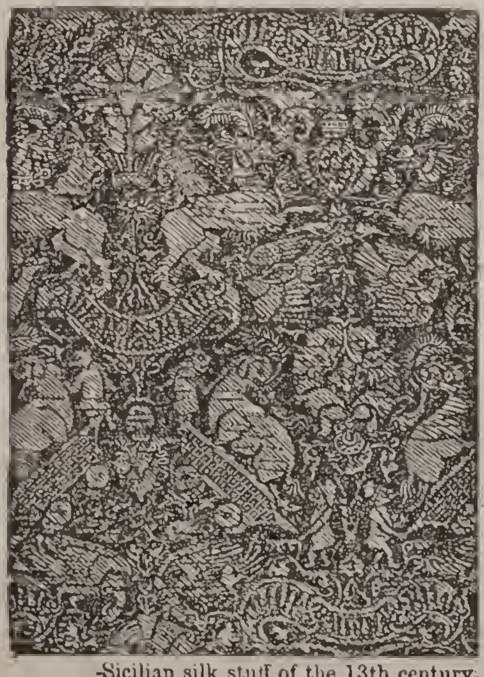
.—Figure of Lucretia from the Triumph of Chastity, woven at Brussels about 1507. Her dress is an Italian velvet, similar in style to that shown in



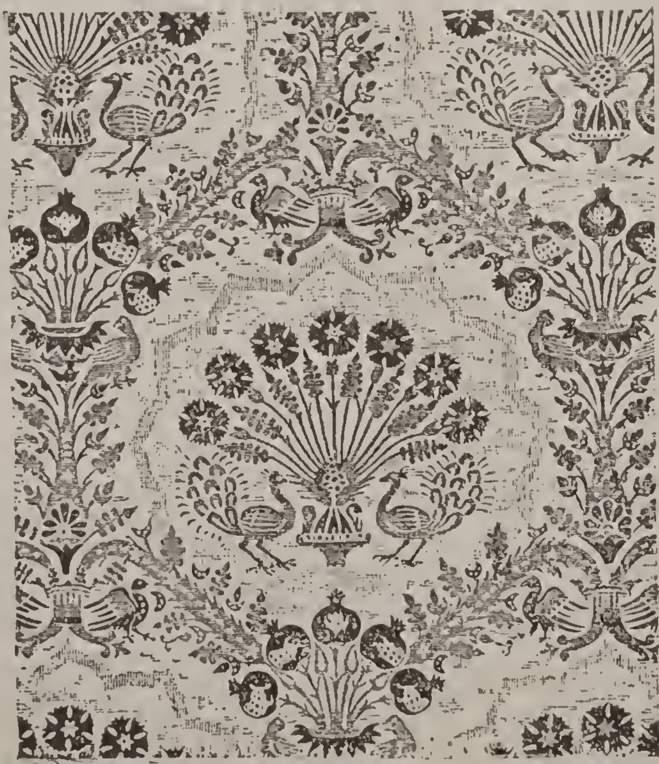
—Genoese or Florentine velvet
silk and gold; 15th century.



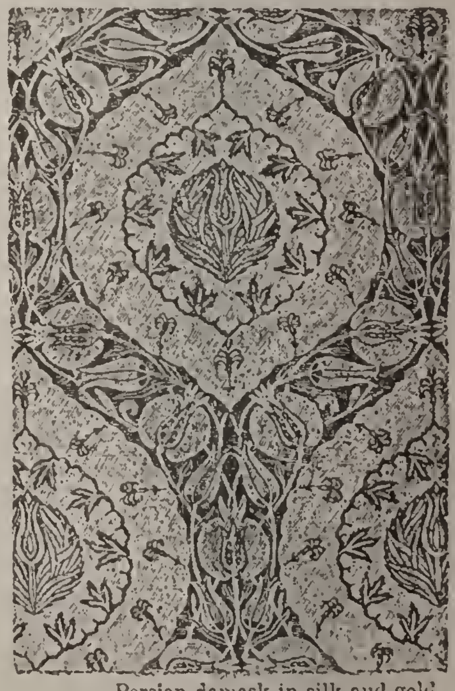
—Persian pile carpet of the 15th century, woven of goats' hair and silk. (South Kensington Museum.)



—Sicilian silk stuff of the 13th century, in St Mary's church, Dantzic.



Silk stuff of Oriental design, woven at Venice in the 15th century. (South Kensington Museu



—Persian damask in silk and gold. (South Kensington Museum.)

simply blocked out square in stone, and then covered with molded plaques of terra-cotta, carefully formed to fit on and round the angles of the block.

Among the Etruscans the use of clay for important sculpture was very frequent—painted terra-cotta or bronze almost excluding marble and stone. An important example was the clay quadriga on the pediment of the temple of Capitoline Jupiter, which, according to one legend, was brought from Veii by Tarquinius Superbus. Many other statues in the early temples of Rome were made of the same material. Among the existing specimens of Etruscan terra-cotta the chief are large sarcophagi, with recumbent portrait effigies of the deceased on the top, the whole being of clay, decorated with painting. Fine examples exist in the Louvre and the British Museum.

As in other branches of art, the Romans closely copied the Greeks in their wide application of terra-cotta for statues, reliefs, and architectural ornaments. A large number of beautiful Græco-Roman reliefs exist, many having designs evidently copied from earlier Greek sculpture. Berlin, the Louvre, the British Museum, and many places in Italy possess fine collections. Many subjects of great interest are represented: a very fine plaque in the Louvre has the scene of Orestes taking refuge at the sacred omphalos at Delphi, which is represented as a conical stone about three feet high, hung round with ornamental festoons made of gold. These terra-cottas belong to the early period of the empire; in the second century A.D. they became much coarser and less Greek in style, like all the sculpture of that time. A plaque in the Louvre, which represents a chariot-race in the circus, bears its maker's stamp, L. S. ER. At the end of the first and in the early part of the second century A.D. the use of terra-cotta for architectural adornment was carried to a high point of perfection in Rome. The British Museum also contains fine specimens of terra-cotta sculpture on a large scale, especially the torso of a nude male figure (Hercules), some terminal figures of Bacchus and a beautiful statue of Urania.

In the fourteenth and more especially in the fifteenth century terra-cotta was adapted in various parts of Europe to the most magnificent and elaborate architectural purposes. In Germany the mark of Brandenburg is specially rich in terra-cotta work. The church of St. Catherine in the town of Brandenburg is decorated in the most lavish way with delicate tracery and elaborate string-courses and cornices, enriched with foliage, all modeled in clay; the town-hall is another instance of the same use of terra-cotta. At Tangermünde, the church of St. Stephen and other buildings of the beginning of the fifteenth century are wonderful examples of this method of decoration; the north door of St. Stephen's especially is a masterpiece of rich and effective molding. In northern Italy this use of terra-cotta was carried to an equally high point of perfection. The western façade of the cathedral of Monza is a work of the most wonderful richness and minute elaboration, wholly executed in clay, in the latter part of the fourteenth century. The cathedral of Crema, the communal buildings of Piacenza, and S. Maria delle Grazie in Milan are striking examples of the extreme splendor of effect that can be obtained by terra-cotta work. The Certosa near Pavia has a most gorgeous specimen of the early part of the sixteenth century; the two cloisters are especially magnificent. Pavia itself is very rich in terra-cotta decoration, especially the ducal palace and the churches of S. Francesco and S. Maria del Carmine. For life, spirit, and realistic truth, combined with sculpturesque breadth, these pieces are masterpieces of invention and manipulation. The portrait busts are perfect models of iconic sculpture.

Much fine terra-cotta work was produced in France during the sixteenth century, partly under Italian influence,—many sculptors from northern and central Italy having settled in France, especially under the patronage of Francis I. In the same century a similar Italian influence prevailed largely throughout Spain, and very clever works were produced there, remarkable for their vivid realism and deceptive pictorial style. In England the elaborate use of terra-cotta did not come into vogue till the early part of the sixteenth century, and then only in certain counties. Essex possesses the finest examples, such as those of the manor house of Layer Marney, built in the reign of Henry VIII. A richly decorated terra-cotta tomb with recumbent effigy exists in the church of Layer Marney; and in the collegiate church of Wymondham in Norfolk there are very large and elaborate sedilia with lofty canopied niches, all of clay, which appear to be of the same date and fabrique as the Essex examples. Most of the terra-cotta sculpture in England, such as that by Torrigiano, of which fragments exist in Westminster Abbey, the colossal heads of the Cæsars at Hampton Court, and the recumbent effigy in the Chapel of the Rolls, were the work of Italian sculptors, mostly from Florence, who were invited to England in the reigns of Henry VII. and Henry VIII.

Of late years terra-cotta for architectural purposes has been employed for some very important buildings in London, such as the natural history museum at South Kensington, the Albert Hall, and the front of the other museum in the Exhibition Road. The durability of well-fired clay, its dense texture, pleasant color, and smooth surface make it specially suitable to an atmosphere laden with acids and soot as is that of London. The surface resists decomposition, and affords little hold to the minute particles of carbon. The great improvements which have been made in the manufacture of terra-cotta will probably lead to its more extensive use. The great difficulty is to retain the sharpness of impression given by the mold, and above all to avoid the uneven shrinkage and warping which is so liable to take place when it is fired in large pieces. Any want of truth in the lines of a long cornice becomes painfully apparent, and each molded block of a door or window-jamb must fit accurately onto the next one, or else the line of molding becomes broken and irregular. Terra-cotta is now made of many different colors, a rich red and a warm ocher or cream color being the most pleasant to the eye. In order to avoid defects it is necessary that the clay should contain a large proportion of powdered silica, and that the whole mass should be thoroughly homogeneous. The method by which these ends are secured is much the same as that employed in the making of pottery. In all the cities of the United States terra-cotta is employed for ornamentation and building purposes with good results. It is made into tiles of varying colors, a rich red and a warm ocher or cream color being the most pleasing to the eye.

TERRANOVA, or TERRANUOVA, a seaport town of Sicily, on a hill at the mouth of the Terranova, in the province of Caltanisetta, and forty-one and a half miles east-southeast from Girgenti. It contains a castle and several large churches, but has little to interest the traveler. Though the harbor is poor, there is a considerable trade in grain, wine, fruit, sulphur, and soda. Cloth is manufactured to a small extent. The population of the town in 1881 was 16,440, that of the commune 17,173. In and near Terranova are the remains of the ancient GELA, (*q.v.*) The modern town owes its origin to the emperor Frederick II.

TERRAPIN. See **Tortoise.**

TERRESTRIAL TEMPERATURE, the distribution of heat over the globe, is represented by isothermal lines, or lines drawn through all places having the same mean temperature. The part of the globe having the highest mean annual temperature forms an irregularly shaped belt, lying along the equator, and comprised between the north and south isothermals of 80°. On either side of this warm belt the temperature diminishes toward the poles, and the lines showing successively this diminution are, speaking in a very loose sense, arranged parallel to the equator, thus showing the all-predominating influence of the sun as the source of terrestrial heat. The coldest portion of the earth's surface is a small oval-shaped patch near to, but not surrounding, the north pole, its mean temperature being 4°. Its narrowest diameter lies north and south, nearly touching the pole on the one side and extending on the other as far south as 72° 30′ N. latitude in 130° W. longitude. While the decrease of temperature in advancing toward the poles corresponds in a general way to what may be called the solar climate, there are deviations brought about by disturbing causes too important to be overlooked. These causes are (1) the currents of the sea; (2) the prevailing winds; and (3) large surfaces of water which are frozen during the year.

Since winds bring with them the temperature of the regions they have crossed, the equatorial current is a warm wind, and the polar is a cold wind; also winds arriving from the ocean are not subject to such variation of temperature during the year as winds from a continent.

In the center of Siberia the January temperature falls to —40, which is 9° colder than the coldest part of the American continent and this center of greatest cold lies near the eastern part of the continent of Asia. On the other hand, in July the interior of the continents is much warmer than their western parts. Hence the interior and eastern parts of Asia and America are characterized by extreme climates, and the western parts by equable climates.

The great fresh water lakes of North America exercise an important influence on the climate of the central parts of North America, for in winter, America, with its frozen lakes, is a truly unbroken continental mass, and its winter climate is therefore continental; whereas in summer its large sheets of fresh water communicate to it many of the features of an insular summer climate.

The whole effect of the disturbing causes is seen at once, if we compare the observed temperature of a place with its normal temperature, that is, the temperature due to it in respect to its latitude. In the northern hemisphere in January the sea and the western parts of the continent are in excess of their normal temperature; elsewhere, there is a deficiency. There are two centers of excess, one to the northeast of Iceland, amounting to 41°, the other in Russian America, amounting only to 18°, and two centers where the temperature is deficient, one at Irkutsk, amounting to —41°, and the other west of Hudson's Bay, amounting to —27°. In July the United States, Europe, Asia, the Indian Ocean, the north of Africa, and the extreme north of South America have their temperature in excess, while elsewhere it is deficient. The centers of excess are, north of Siberia, 13.5°; Red Sea, 11.0°; and the northwest of the United States, 4.5°. And the centers where the temperature is deficient are, the entrance to Hudson's Bay, —11.0°, and the Aleutian Islands, —11.0°.

TERRE HAUTE, the county seat of Vigo county, Ind., a prominent railroad center and a manufacturing city of conspicuous importance, is situated on the Wabash river, seventy-three miles west of Indianapolis, the capital of the State. It is on the main line of the Chicago and Eastern Illinois; St. Louis, Vandalia, Terre Haute and Indianapolis; Evansville and Terre Haute; Terre Haute and Peoria; Terre Haute and Southeastern, and Indianapolis and St. Louis railroads, which with the Wabash and Erie canal place the city in immediate connection with all points of interest in Indiana and adjoining States, as also with the seaboard and western territories. The city occupies an elevated plateau which adds to its attractive appearance, and is laid out with every regard to the elaboration of its natural advantages, both in respect to beauty of site and picturesque surroundings. The residence portion of Terre Haute has been made a feature of the city's improvements, many of the houses having been erected in the midst of groves and gardens, and otherwise rendered specially attractive. The business district of the city is also well built and contains many prominent and substantial edifices for commercial, educational, religious and general purposes. There are three national banks with a total capital of $550,000 doing business in Terre Haute, besides one savings and two private banks; one tri-weekly, five weekly, and two daily papers are issued, also one semi-monthly and three monthly periodicals. A court house and opera house, commodious and handsomely appointed, are among the leading structures, in addition to which the city is the location of the State Normal school, the Polytechnique Institute and Providence Hospital, also containing seven public school-houses, nineteen churches, a number of hotels, together with halls and public institutions of leading importance. The manufactures embrace foundries and machine shops, nail, tool, and car-works, flour and hominy mills, straw-board works, distilleries, blast furnaces, etc., etc. The city is connected with the west bank of the Wabash river by an iron bridge, and important coal mines are in operation in the vicinity. Gas and electric lights are used. The population was 8,594 in 1860, 16,103 in 1870, 26,042 in 1880, and 30,217 in 1890.

TERSTEEGEN, Gerhard, German religious writer, was born at Mörs in Rhenish Prussia on November 25, 1697. After being educated at the gymnasium of his native town, he pursued for some years the calling of a ribbon-maker. In 1728 he withdrew from all secular pursuits and gave himself entirely to religious work. His writings include a collection of hymns (*Blumengärtlein*, 1729; last edition, Stuttgart, 1868), a volume of *Gebete*, and another of *Briefe*. He died at Mühlheim in Rhenish Prussia, April 3, 1769.

TERTIARIES. See Franciscans.

TERTULLIAN, whose full name was Quintus Septimius Florens Tertullianus, is the earliest and after Augustine the greatest of the ancient church writers of the West. Before him the whole Christian literature in the Latin language consisted of a translation of the Bible, the *Octavius* of Minucius Felix—an apologetic treatise written in the Ciceronian style for the higher circles of society, and with no evident effect for the church as a whole—and a list of the books recognized as canonical (the so-called Muratorian fragment).

Tertullian's place in universal history is determined by (1) his intellectual and spiritual endowments, (2) his moral force and evangelical fervor, (3) the course of his personal development, (4) the circumstances of the time in the midst of which he worked.

Tertullian was a man of great originality and genius, characterized by the deepest pathos, the liveliest fancy, and the most penetrating keenness, and was endowed with ability to appropriate and make use of all the methods of observation and speculation, and with the readiest wit. His writings in tone and character are always alike "rich in thought and destitute of form, passionate and hairsplitting, eloquent and pithy in expression, energetic and condensed to the point of obscurity." His style has been characterized with justice as dark and resplendent like ebony. His eloquence was of the vehement order. Tertullian both as a man and as a writer had much in common with the apostle Paul. In spite of all the contradictions in which he involved himself as a thinker and as a teacher, Tertullian was a compact ethical personality. What he was he was with his whole being. Once a Christian, he was determined to be so with all his soul, and to shake himself free of all half measures and compromises with the world.

Among all the fathers of the first three centuries Tertullian has given the most powerful expression to the terrible earnestness of the Gospel. The course of Tertullian's personal development fitted him in an altogether remarkable degree to be a teacher of the church. Born at Carthage of good family—his father was a "centurio consularis"—he received a first-rate education both in Latin and in Greek. He was able to speak and write Greek, and gives evidence of familiarity alike with its prose and with its poetry; and his excellent memory—though he himself complains about it—enabled him always to bring in at the right place an appropriate, often brilliant, quotation or some historical allusion. He studied with earnest zeal the Greek philosophers; Plato in particular, and the writings of the Stoics, he had fully at command, and his treatise *De Anima* shows that he himself was able to investigate and discuss philosophical problems. From the philosophers he had been led to the medical writers, whose treatises plainly had a place in his working library. But no portion of this rich store of miscellaneous knowledge has left its characteristic impress on his writings; this influence was reserved for his legal training. At Rome in mature manhood Tertullian became a Christian, under what circumstances we do not know, and forthwith he bent himself with all his energy to the study of Scripture and of Christian literature. Not only was he master of the contents of the Bible: he also read carefully the works of Hermas, Justin, Tatian, Miltiades, Melito, Irenæus, Proculus, Clement, as well as many Gnostic treatises, the writings of Marcian in particular. In apologetics his principal master was Justin, and in theology proper and in the controversy with the Gnostics, Irenæus. As a thinker he was not original, and even as a theologian he has produced but few new schemes of doctrine, except his doctrine of sin. His special gift lay in the power to make what had been traditionally received impressive, to give to it its proper form, and to gain for it new currency. From Rome Tertullian visited Greece and perhaps also Asia Minor; at any rate we know that he had temporary relations with the churches there. He was consequently placed in a position in which he could check the doctrine and practice of the Roman Church. Thus equipped with knowledge and experience, he returned to Carthage and there laid the foundation of Latin Christian literature. At first, after his conversion, he wrote Greek, but by and by Latin almost exclusively. The elements of this Christian Latin language may be enumerated as follows:—(i.) it had its origin, not in the literary language of Rome as developed by Cicero, but in the language of the people as we find it in Plautus and Terence; (ii.) it has an African complexion; (iii.) it is strongly influenced by Greek, particularly through the translation of the Septuagint and of the New Testament, besides being sprinkled with a large number of Greek words derived from the Scriptures or from the Greek liturgies; (iv.) it bears the stamp of the Gnostic style and contains also some military expressions; (v.) it owes something to the original creative power of Tertullian. As for his theology, its leading factors were—(i.) the teachings of the apologists; (ii.) the philosophy of the Stoics; (iii.) the rule of faith, interpreted in an anti-Gnostic sense, as he had received it from the Church of Rome; (iv.) the Soteriological theology of Melito and Irenæus; (v.) the substance of the utterances of the Montanist prophets (in the closing decades of his life). It was his desire to unite the enthusiasm of primitive Christianity with intelligent thought, the original demands of the Gospel with every letter of the Scriptures and with the practice of the Roman Church, the sayings of the Paraclete with the authority of the bishops, the law of the churches with the freedom of the inspired, the rigid discipline of the Montanist with all the utterances of the New Testament and with the arrangements of a church seeking to set itself up within the world. At this task he toiled for years, involved in contradictions which it took all the finished skill of the jurist to conceal from him for a time. At last he felt compelled to break off from the church for which he had lived and fought; but the breach could not clear him from the contradictions in which he found himself entangled. After having done battle with heathens, Jews, Marcionites, Gnostics, Monachians, and the Catholics, he died an old man, carrying with him to the grave the last remains of primitive Christianity in the West, but at the same time in conflict with himself.

Although Tertullian's extant works are both numerous and copious, our knowledge of his life is very vague. He cannot have been born much later than about 150. The date of his conversion to Christianity is quite uncertain; there is much in favor of the years between 190 and 195. It is certain that he was settled in Carthage in the second half of 197, the date of his writing his *Apologeticus* (and shortly afterwards) his two books *Ad Nationes;* we also know that he became a presbyter in Cartharge and was married. His recognition of the Montanistic prophecy in Phrygia as a work of God took place in 202–203, at the time when a new persecution broke out. For the next five years it was his constant endeavor to secure the victory for Montanism within the church; but in this he became involved more and more deeply in controversy with the majority of the church in Carthage and especially with its clergy, which had the support of the clergy of Rome. On his breach with the Catholic church, probably in 207–208, he became the head of a small Montanist community in Carthage. In this position he continued to labor, to write, and to assail the lax Catholics and their clergy until at least the time of Bishop Calixtus in the reign of Elagabalus. The year of his death is uncertain. That he returned at last to the bosom of the Catholic church is a mere legend, the motive of which is obvious; his adherents after his death continued to maintain themselves as a small community in Carthage. Although he had left the church, his earlier writings continued to be extensively read; and in the fourth century his works, along with those of Cyprian, were the principal reading of Western Christians, until they were superseded by those of Jerome, Ambrose, Augustine, and Gregory.

The works of Tertullian, on the chronology of which a great deal has been written, and which for the most part do not admit of being dated with perfect certainty, fall into three classes—the apologetic, the polemical theological, and the ascetic. And in point of time also three periods can readily be distinguished, the years 202–203 and 207–208 constituting the divisions. Some of the things he wrote have unfortunately disappeared.

in particular the *De Spectaculus*, *De Baptismo*, and *De Virginibus Velandis* in Greek; his works in Latin on the same subjects have survived.

TERUDANT, or TARUDANT. See MOROCCO.

TERUEL, a province of Spain, forming part of the ancient kingdom of Aragon, is bounded on the north by Zaragoza, on the east by Tarragona, on the south by Castellon de la Plana and Valencia, on the southwest by Cuenca, and on the west by Guadalajara, and has an area of 2,363 square miles. It is intersected from east to west by the mountain chains of Albarracin and Gudar, from which several offsets diverge on either side. The loftiest summit is the Muela de San Juan (5,280 feet), which is covered with snow for a great part of the year. These sierras give rise to several large rivers, the principal being the Tagus, the Guadalquivir, the Jiloca, and the Guadalope. The chief products are grain, wine, oil, cheese, fruits, timber, flax, hemp, silk, wool, and saffron, together with cattle, sheep, and swine; while in the busier centers some slight manufacture of coarse cloth, paper, leather, soap, pottery, and esparto goods is carried on. The population of the province in 1877 was 249,000.

TERUEL, the capital and most important town of the above province, is situated on the left bank of the Guadalquivir, 142 miles east of Madrid, and on the high road from Calatayud to Valencia. It is an ancient walled city, fast falling into decay, with narrow, gloomy streets and crumbling mediæval houses. In the cloisters of San Pedro lie the remains of the celebrated "lovers of Teruel," Juan de Marcilla and Isabella de Segura, whose pathetic story has formed the subject of numerous dramas and poems by Perez de Montalban, Yaque de Salas, Hartzenbusch, and others. The cathedral is Churrigueresque. Teruel was raised to the dignity of a see in 1577, the bishop being suffragan of Zaragoza. The population of the city in 1877 was 9,482.

TESCHEN (Polish *Cieszyn*), the chief town of a duchy in Austrian Silesia, is situated on the Olsa, a tributary of the Oder, thirty-four miles southeast of Troppau. It combines both Polish and German peculiarities in the style of its buildings, and contains five churches, the most interesting of which are the parish church, which formerly belonged to a Dominican monastery, and the Gnadenkirche, one of the Protestant churches built in terms of the treaty of Altranstädt in 1706. The manufacturing industry of the town is slight, and, since the construction of the railway *via* Oderberg, Teschen has lost much of the trade formerly commanded by its position near the borders of Silesia, Hungary, Moravia, and Galicia. A flax dressing and spinning factory, a large brewery, and several furniture factories are the chief industrial establishments in the town. The population in 1880 was 13,004.

TESSIN. See TICINO.

TEST ACTS. The principle that none but persons professing the established religion were eligible for public employment was adopted by the legislatures of both England and Scotland soon after the Reformation. In England the Acts of Supremacy and Uniformity and the severe penalties denounced against recusants, whether Roman Catholic or Nonconformist, were affirmations of this principle. The Act of 7 Jac. I. c. 2 provided that all such as were naturalized or restored in blood should receive the sacrament of the Lord's Supper. It was not, however, until the reign of Charles II. that actual receiving of the communion of the Church of England was made a condition precedent to the holding of public offices. The immediate cause of the Test Act (the full title of which is "An Act for preventing dangers which may happen from popish recusants") was the king's declaration of indulgence, dispensing with laws inflicting disabilities on Nonconformists. This Act enforced upon all persons filling any office, civil or military, the obligation of taking the oaths of supremacy and allegiance and subscribing a declaration against transubstantiation, and also of receiving the sacrament within three months after admittance to office. The Act did not extend to peers; but in 1678 30 Car. II. st. 2 enacted that all peers and members of the House of Commons should make a declaration against transubstantiation, invocation of saints, and the sacrifice of the mass—a special exception being made in favor of the duke of York. After a considerable number of amendments and partial repeals by the legislature of the Acts of 1661, 1672, and 1678, and of Acts of indemnity to protect persons under certain circumstances from penalties incurred under the Test Act, the necessity of receiving the sacrament as a qualification for office was abolished by 9 Geo. IV. c. 17, and all Acts requiring the taking of oaths and declarations against transubstantiation, etc., were repealed by the Roman Catholic Relief Act of 1829 (10 Geo. IV. c. 7). To be a member of the Church of England was a necessary condition precedent for holding most university or college offices by the Act of Uniformity of 1662, and such offices were not affected by the Toleration Act of 1688 and the Roman Catholic Relief Act of 1829. In 1871 the University Tests Act abolished subscriptions to the articles of the Church of England, all declarations and oaths respecting religious belief, and all compulsory attendance at public worship in the universities of Oxford, Cambridge, and Durham.

A religious test was imposed in Scotland immediately after the Reformation. By 1567, c. 9, no one was to be appointed to a public office or to be a notary who did not profess the Reformed religion. The Scotch Test Act was, 1681, c. 6, rescinded by 1690, c. 7. Renunciation of popery was to be made by persons employed in education (1700, c. 3). By 1707, c. 6, all professors, principles, regents, masters, or others bearing office in any university, college, or school in Scotland were to profess and subscribe to the Confession of Faith. The necessity for subscription to the Confession of Faith by persons holding a university office (other than that of principal or professor of theology) was removed by 16 and 17 Vict. c. 89. An oath of allegiance was required by the Irish Act of Supremacy (2 Eliz. c. 1). The English Act of 3 Will. and M. c. 2 substituted other oaths and enforced in addition from peers, members of the House of Commons, bishops, barristers, attorneys, and others a declaration against transubstantiation, invocation of the Virgin Mary and the saints, and the sacrifice of the mass. By the Irish Act of 2 Anne c. 6 every person admitted to any office, civil or military, was to take and subscribe the oaths of allegiance, supremacy, and abjuration, to subscribe the declaration against transubstantiation, etc., and to receive the Lord's Supper according to the usage of the Church of Ireland. English legislation on the subject of oaths and declarations was adopted in Ireland by Yelverton's Act, 21 and 22 Geo. III. c. 48, § 3, (Ir.) These provisions were all repealed by the Promissory Oaths Act, 1871. The Roman Catholic Relief Act of 1793 (33 Geo. III. c. 21, Ir.) excepted Trinity College, Dublin, from its provisions, and tests existed in Dublin university until 1873. By art. 6 of the constitution, "no religious test shall ever be required as a qualification to any office or public trust under the United States." A similar provision is generally included in the State constitutions.

TESTAMENT. See WILL.

TESTIMONY. See EVIDENCE.

TETANUS, or LOCK-JAW, is one of the most form able diseases of the nervous system, and is characterized by an involuntary, persistent, intense, and painful contraction or spasm, of more or less extensive groups of the voluntary muscles, nearly the whole of the body being sometimes affected. The muscles of the neck, jaws, and throat are almost always the first to give evidence of the presence of the disease. The patient finds it difficult in turning or bending his head, and supposes he has what is called a stiff neck. He finds that he is unable to open his mouth with the accustomed facility. At length, his jaws close, sometimes gradually, but with great firmness, sometimes (it is claimed) suddenly and with a snap. In four cases, perhaps, out of five, the disease begins in this way with trismus or lock-jaw, so that this last is the vulgar name for the complaint. Along with this symptom, or very soon afterward, the muscles concerned in swallowing become affected; and in a short time there comes on what is often the most distressing part of the disorder, an acute pain at the lower part of the sternum, piercing through to the back. This pain depends, it can scarcely be doubted, upon cramp of the diaphragm, and is subject to aggravation in paroxysms.

The muscles that are affected remain permanently contracted till either recovery or death ensues, and some of them, as for example, the muscles of the abdomen, are so rigid, as when struck with the fingers to resemble a board, although a perfect remission of the spasm scarcely ever occurs, except sometimes during sleep. Exacerbations of the spasms, on the other hand, commonly occur every ten minutes, or quarter of an hour, usually beginning by an increase of the pain at the sternum, and lasting for two or three minutes; and as the disease advances these paroxysms become more frequent. The powerful muscles of the back usually overcome the muscles in the front of the body, the result of which is that the patient during a paroxysm rests solely on his head and heels, while his body is raised in an arch form. Occasionally the muscular contraction predominates in the opposite direction and brings the head and knees in contact, and still more rarely the body is bent to one side.

There are two principal causes of this disease, viz: (1) Exposure to cold and damp; and (2) bodily injuries. When tetanus arises from the first of these causes it is termed idiopathic; and when from the second traumatic. Idiopathic tetanus is so rare, at all events in this country, that we may pass at once to the consideration of the traumatic variety. The disease is liable to follow any kind of an injury, and is much more common in tropical than in temperate climates. The interval between the reception of the injury and the first tetanic symptoms commonly varies from the fourth to the fourteenth day, and rarely exceeds twenty-two days, some time in the second week being the most common period. As a general rule, the more rapidly the disease comes on the more fatal will be the result.

Mere trismus, or lock-jaw, may be induced by affections of the teeth, especially by difficult dentition of the wisdom-teeth; but this is a purely local affection, in which the muscular contraction, though persistent, is never increased by painful spasmodic paroxysms, and which usually disappears on removal of the exciting cause; and the general knowledge of this fact may tend to remove unnecessary terrors. Hysteria sometimes mimics the phenomena of tetanus with marvelous fidelity; and hydrophobia and tetanus have been mistaken for one another, in consequence of the spasms of tetanus sometimes affecting the muscles of deglutition and inducing a fear of swallowing. There is, however, seldom any serious difficulty in detecting the difference between tetanus and any other disease. But there is a form of poisoning which produces almost every symptom of tetanus, and which may be termed artificial tetanus. If strychnia or brucia, or their salts, or vegetable matter containing either or both of these alkaloids, as nux vomica, St. Ignatius' beans, or the juice of the upas tiente, be administered, either by the stomach or by inoculation, into the system, it induces all the symptoms of intense tetanus, and there is no test by which to distinguish the results of the disease and of the poisoning, except that the disease never proves so quickly fatal as the rapid cases of poisoning with strychnia. In the way of treatment almost every known medicine has been prescribed, and whatever plan be adopted, a vast majority of the cases terminate fatally. All that can be done is to enable the patient to weather the storm by giving him as much strength as possible, and not by adding fuel to the fire by all sorts of applications and internal remedies, which have over and over again signally failed.

Tetanus, or lock-jaw, occurs in most of the domesticated animals, but most frequently in horses and sheep. It is usually produced by cold or wet, by intestinal worms, obstinate constipation or injuries. The symptoms usually come on gradually and involve most of the muscular structures, which become hard and rigid; the limbs move stiffly, the tail is upraised, the bowels are constipated. The animal must be kept perfectly quiet, and in an airy but tolerably warm place, and plentifully suppled with cold water, and with soft, sloppy but tolerably nutritive food, which it will usually greedily suck in through its firmly closed teeth. A full dose of purgative medicine must be given at once; extract of belladonna repeated twice or thrice daily, is occasionally serviceable; any discoverable wound or injury should be fomented or poulticed; bleeding, sedatives and all causes of irritation must be avoided. In adult animals most cases are fatal; but among young animals, especially when the attack results from exposure to cold, many recoveries occur.

TETRARCH (τετράρχης), the ruler of a tetrarchy (τετραρχία), that is, in the original sense of the word, of one-quarter of a region. The title of tetrarch is familiar in the New Testament as borne by certain princes of the petty dynasties which the Romans allowed to exercise a dependent sovereignty within the province of Syria. After the death of Herod the Great (4 B.C.) his realm was shared among his three sons; the chief part, including Judæa, Samaria, and Idumea, fell to Archelaus (Matt. ii., 22), with the title of ethnarch; Philip received the northeast of the realm, and was called tetrarch; and Galilee was given to Herod Antipas, who bore the same title (Luke iii., 1). These three sovereignties were reunited under Herod Agrippa from 41 to 44 A.D. Another tetrarchy is mentioned in Luke iii. 1, viz., that of Lysanias in the little district of Abilene, near Damascus, in the valley of the Barada.

TETUAN (*Tettáwin*), a town of Morocco, about 23 miles south-southwest from Ceuta and 44 southeast from Tangiers, is picturesquely situated about nine miles inland on the steep slope of a hill, behind which rise the bold Rif Mountains. The streets are narrow, unpaved and dirty, and with few exceptions the houses are poor. Some of the numerous mosques, however, are handsome. The principal manufactures are gun-barrels, coarse woolen cloths and woolen and silk sashes. The harbor of Tetuan, at the mouth of the Martil, allows only small vessels to cross the bar, and the roadstead is much exposed to the east. There is some export trade in cattle, grain, fruit, leather and wool, principally to Gibraltar. The population of Tetuan is estimated at about 20,000 (5,000 Jews).

TEUTONES, or TEUTONI, a powerful German

tribe, first appearing in history along with the Cimbri, (*q.v.*) They are again mentioned at a later period by Pliny and others as inhabiting a district in the northwest of Germany to the north of the Elbe. The name of Teutones was never employed either by the Germans themselves or by the Romans as a general name for the whole German nation.

TEUTONIC LANGUAGES. See Germany; also English Language, Goths, Scandinavian Languages, Frisians, and Holland.

TEUTONIC ORDER, The, or Teutonic Knights of St. Mary's Hospital at Jerusalem (*Deutscher Orden, Deutsche Ritter, Orden der Ritter des Hospitales St. Marien zu Jerusalem*), is one of the three great military and religious orders to which the crusades gave birth. Its name is derived from a German hospital founded at Jerusalem in 1128, which disappeared on the capture of the Holy City by the Saracens in 1187. Like the two other military orders, the Teutonic order adopted the Augustine rule of life; and in addition to the ordinary monastic vows, the members laid upon themselves the special obligations of tending sick and wounded pilgrims and of fighting the pagans. Frederick, duke of Swabia, took the young order under his protection, and it soon received charters from the pope and emperor, entitling it to the same privileges as the Templars and Knights of St. John. Whatever was the case at first, the members of the order were ultimately required to be Germans of honorable birth. The distinguishing garb of the order consisted of a white mantle with a black cross. Almost at once a rich stream of benefactions of all kinds began to flow into the coffers of the order, which gradually acquired extensive territories in Palestine and also in Germany and other parts of Europe. Its first seat was at Acre, and the first grand-master was a Rhenish knight named Herman Walpot of Bassenheim.

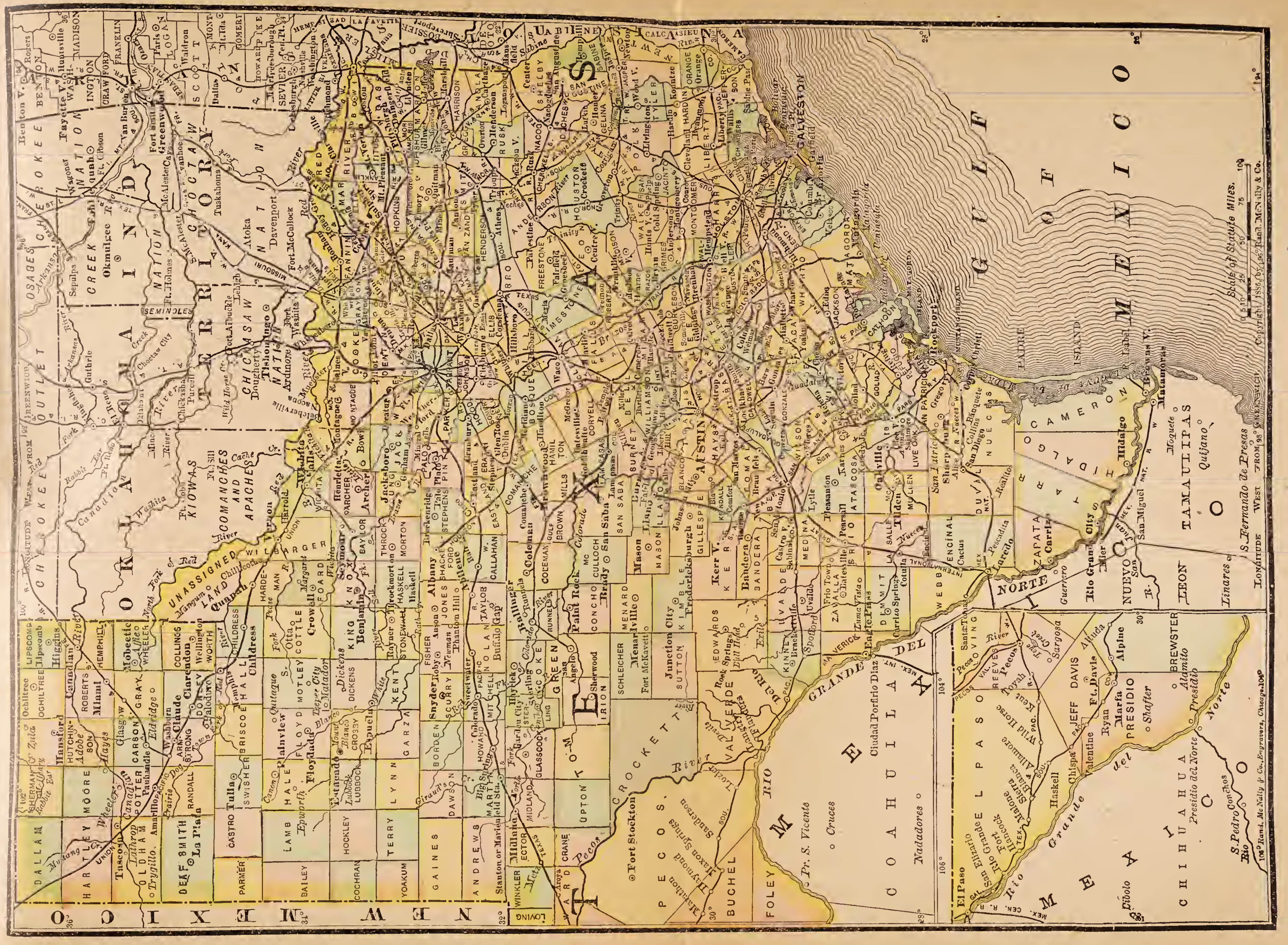
So long as the order maintained its own high standard all went well with it. But its internal decay was synchronous with external events that would alone have been extremely perilous. The union of Poland and Lithuania in 1386 raised up a jealous neighbor, whose power it was wellnigh impossible in the long run to resist, while the nominal conversion of the latter to Christianity struck at the root of the order's prosperity by depriving it of its mission. When there were no more heathens within reach to convert and despoil, the chief attraction to outsiders to join its ranks disappeared. After the conversion of Prussia into a secular duchy the Teutonic order still continued to exist as an ecclesiastical organization, possessing eleven bailiwicks in different parts of Europe, with a total area of 850 square miles and 88,000 inhabitants. The headquarters were fixed at Mergentheim in Swabia. In 1801 the bailiwicks to the west of the Rhine were absorbed by France, and in 1809 the order was entirely suppressed by Napoleon, its lands going to the secular principalities within which they lay. In 1840 the order was resuscitated in Austria, where it now exists as a semi-religious knighthood, presided over by a royal archduke. Of late it has been doing something toward justifying its existence and connecting itself with its past history by engaging in the ambulance service in time of war. The bailiwick of Utrecht, which survived the decree of Napoleon, also still exists, but the Dutch representatives of the order have become Protestants. The jewel of the order consists of a black and white cross, surmounted by a helmet with three feathers.

TEWKESBURY, an ancient borough and market-town of Gloucestershire, England, is situated in a fine pastoral valley at the junction of the Severn and the Upper Avon, and on the Midland and Great Western railways, 15 miles south of Worcester and 126 northwest of London. The Severn is crossed by an iron bridge with a flattened arch of 170 feet span, erected by Telford in 1824. Of the great Benedictine abbey, one of the richest foundations in England, refounded and enlarged by Sir Robert Fitz-Hamon in the twelfth century on the site of the ancient hermitage and Saxon monastery, there only remain the gate and part of the cloisters. Formerly Tewkesbury had a woolen trade and an important mustard manufacture, but it is now chiefly dependent on its agricultural trade. The population of the municipal borough (area, 2,619 acres) in 1871 was 5,409, and in 1881 5,100.

TEXARKANA, the county seat of Miller county, Ark., is centrally located, partly in Texas, and an important business and railroad center. The St. Louis, Iron Mountain and Southern, International and Great Northern, Texas and Pacific, and St. Louis, Arkansas and Texas meet here, and occupy the union depot conjointly. The city is also situated in the midst of an extensive pinery region for which it is the distributing point and base of supplies. It has a court house, five churches, public schools, one daily and one weekly paper, one bank, three hotels, an opera house, and many stores, conducting a general line of commission and commercial business. The manufacture of lumber and lumber products is largely engaged in, enlisting a large capital and producing an annual output, steadily increasing in volume and value. In addition to this, there are other descriptions of manufacture usually carried on in a progressive and enterprising city. The population, 3,223 in 1880, was in 1890 returned at 3,486.

TEXAS, the largest in area of the United States of America, is bounded by the Gulf of Mexico on the southeast, by Louisiana and Arkansas on the east, by Arkansas and the Indian Territory on the north, the latter extending north of its northern prolongation (the Panhandle), by New Mexico on the west and north of its western prolongation (the trans-Pecos region), and by Mexico on the southwest. Its area in 1880 was 262,290 square miles, or one-eleventh (nearly 9 per cent.) of the entire area of the United States. The extreme length is 740 miles, the breadth 825, and the coast line 400 miles. The boundaries are: The Gulf of Mexico from the Rio Grande to the Sabine river, the Sabine river to 32° N. latitude, thence the meridian of 94° 10′ to the Red River of Louisiana, thence following that river west to its intersection with the 100th meridian, thence north to latitude 36° 30′, thence west to the 103° W. longitude, thence south to latitude 32°, thence west to its intersection with the Rio Grande, which river constitutes the southwestern border of the State to the Gulf of Mexico.

The surface features are exceedingly varied, the prevailing elements being steppes or treeless plains in the northwest, mountains west of the Pecos river, forests in the east, marshes adjacent to the coast, low prairies in the southeast, and a combination of prairies and broken hills, interspersed with forest growth and thickets of tall shrubs (chaparral), in the center. These regions are classified as follows: The coast plain is the direct geographical and geological continuation of the other States which border on the Gulf of Mexico. It includes all the country east of a line concentric with the coast, drawn from Texarkana in the northeast corner of the State to near Laredo on the Rio Grande. The general direction of its slope, in common with that of the rest of the State, is from northwest to southeast. Its altitude ranges up to 500 feet. The immediate coast strip is newly made marshland; west of this and


TEXAS
OKLAHOMA TERRITORY
INDIAN TERRITORY
NEW MEXICO
GULF OF MEXICO
MEXICO
COAHUILA
CHIHUAHUA
TAMAULIPAS
NUEVO LEON
LOUISIANA
ARKANSAS
AUSTIN
GALVESTON
Scale of Statute Miles.
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north of the Colorado river are forests; and to the south of it the country is mostly a plain. The black prairie region succeeds the coast plain on the west. Its western border is sharply defined from the Red river to the Rio Grande, beginning at Denison, passing through or near the cities of Sherman, Dallas, Waco, Austin, and San Antonio, and then deflected westward to Eagle Pass. It is a gently undulating prairie, covered with a rich black soil, and varies in altitude from 300 to 700 feet. The central region extends from the black prairie region on the east to the eastern escarpment of the great plains on the northwest and the trans-Pecos mountains on the southwest. This is the only region of Texas which is not the direct continuation of the physical features of some adjoining political division. A great variety of conditions is embraced within its bounds. In its northeastern part are two long belts of stunted forest (the Cross Timbers), extending from the Red river to the Brazos, and separated by a prairie fifty miles in width. This is the most fertile portion of the entire region. The region, as a whole, is poorly watered. It is best adapted for cattle and sheep raising, and is the chief locality of those industries in Texas. The altitude varies from 700 to 2,500 feet. The plains region is the portion of the State west of the 101st meridian and north of the 32d parallel, commonly known as the "Staked Plain" (Llano Estacado). The eastern edge is well marked by a steep escarpment, which, in consequence of destructive erosion, is constantly receding to the westward. The surface is smooth, and utterly devoid of forest growth or streams of water, but there are many small ponds or lakes, and in the southern part these are saline. The soil is light, rich, and porous, and is covered with a good growth of grass. Until a few years ago this region was totally unpeopled, but many portions of it are now (1890) used for grazing purposes, water being secured by means of wells or artificially constructed reservoirs. The trans-Pecos or mountainous region west of the Pecos river is composed of numerous mountain peaks and ranges, with intervening valleys of many miles in width. It is poorly watered, and the population outside the immediate Rio Grande valley is very sparse. The general level of the country is from 3,000 to 5,000 feet.

The rivers are separable into several sub-systems. The Rio Grande and the Arkansas, constituting the north and south limits of the Texas drainage system, with their respective tributaries, the Pecos and the Canadian, originate in a limited district of northern New Mexico and Colorado, and ultimately reach the sea at points a thousand miles apart. The Canadian and the Pecos have cut deep cañons through the Llano Estacado. The former continues eastward through the Indian Territory, and the latter southward, joining the Rio Grande between 101° and 102° W. longitude on the southern border of the State. The Rio Grande and the Pecos receive no tributaries of importance in Texas, but are constant in their flow. The next and most important group comprises the Red, the Brazos, and the Colorado, all of which originate along the Eastern border of the Llano. They traverse similar regions, and have a general resemblance in character of sediment, irregularity of flow, velocity, and topography of drainage basins. Another important group consists of the Sabine, the Trinity, the San Marcos, the Guadalupe, and the Nueces, most of which have their origin near the western border of the black prairie region. These streams have a greater volume and are more constant in flow than any others, and are usually without deep cañons or wide bottoms. Another subsidiary system of streams originates in the narrow Quaternary region along the coast, within the district of the greatest rainfall. In general, the rivers of Texas are not adapted for irrigation or navigation. Neither do they afford much available water power north of Austin.

The entire geologic series, with a few exceptions, is represented in Texas. The earlier Palæozoic rocks, including the pre-Cambrian, the Potsdam (OC), and the Ordovician (OC), up to the Trenton, underlie the State, but are only exposed in two limited districts. The first of these is in the counties of Mason, Llano, Burnet, and San Saba in the central region; the other is in the disturbed mountainous portion of the trans-Pecos region. The carboniferous rocks and most of the succeeding formations are exposed in two widely separated portions of the State, with entirely different lithological and faunal aspects. The mutual relations of these series have never been traced. The Cretaceous is by far the most conspicuous and extensive of the geologic formations of the State. It once covered the entire territory, but has been eroded away in many places west of the black prairie region, exposing the older formations, and is covered to the east of that region by more recent deposits. From the fact that the lowest member of the series is found resting directly upon the pre-Cambrian in Llano county, the Carboniferous in Lampasas and the counties northward, the Silurian in the trans-Pecos region, and the Jura-Trias beds in the Plains region, it is evident that its beginning marked a period of continental submergence, and that this submergence, from the great thickness of pelagic sediments in it, was long continued. The lowest member of the series, the oldest known of the American Cretaceous, is unknown elsewhere in the United States, and its peculiar features give individuality to the central region. The Middle and the Upper Cretaceous are also well exposed. The black prairie region is underlain by the middle and upper groups of the marine Cretaceous characteristics of the other Gulf States and known as the Rotten Limestone and Ripley groups.

The final emergence of the State began in Middle Cretaceous time, and was connected with the same movements that brought up the Rocky Mountain system. The strata of Texas, except the Paleozoic groups, are soft, and yield readily to disintegration. A few eruptive sheets are found in the trans-Pecos region and along the lower Rio Grande, being remnants of the eastern edge of the great eruptive area of the Rocky Mountain region. Granitic masses occur, as extrusions from the pre-Cambrian, in the central and trans-Pecos Paleozoic deposits.

The only true mountains in Texas are situated west of the Pecos, with the exception of a few foot-hills (*lomitas*) which reënter the State from Mexico near Eagle Pass and follow the river to an undetermined point below Laredo. The principal ranges are the Guadalupe, Limpia, Chinali, Los Chisos, Organ, and Franklin Mountains. They are composed of older rocks, in most places; the later formations have been washed away, except where protected by eruptive flows. The most eastern and northern of these mountains are usually the highest. Guadalupe Peak is 9,000 feet; Limpia Peak and the crest of the Chinalis, from 3,500 to 8,000 feet; Eagle Mountains, 7,000; and the intervening valleys from 3,500 to 5,000 feet. The low buttes of the central region are miscalled mountains upon most maps. Near the 100th meridian another escarpment occurs, and along the eastern and southern borders of the Staked Plain still another. The western part of the coast plain has a few low hills. The rest of the State has no notable prominences.

The mineral resources of Texas have not been mapped or studied, and hence the State ranks low in mineral products. The trans-Pecos region is rich in silver and lead ores, but the State owns the mineral rights of nearly all the land, and has hitherto declined to open them to development. Only one mine is worked here. Silver and gold have also been discovered and mined in Llano and Mason counties, but without successful results. Gold occurs throughout the marine limestones of the lowest (Texas) group of the Cretaceous, but not in sufficient quantity for profitable extraction. Rich but not abundant copper ores occur in the drift of the gypsum country. Iron ore is found in the Tertiary of eastern Texas, and is profitably reduced in a few charcoal furnaces by the aid of convict labor. At present these are remote from coal and suitable means of transportation. Magnetic iron ore occurs in the pre-Cambrian rocks of Mason county, and recent analyses show it to be equal in quality to the best Swedish ores. It is in great abundance, but remote from means of transportation and fuel. Ores of iron (sphæro-siderite) occur in the central Carboniferous formation, but their commercial value is unknown. The non-metals occur in great abundance in different portions of the State, including salt, gypsum, magnesium sulphate, natural cements, kaolin, and other clays. The unutilized beds of massive gypsum are, with the exception of those of the Sahara and the Andes, the purest and most extensive in the world. Salt is gathered from lacustral deposits or mined at El Paso, Colorado City, and along the lower Gulf coast for local use. The coals of the central Carboniferous area have been worked to some extent, but are generally of inferior quality, having from 50 to 70 per cent. of ash. Tertiary fibrous lignite, of light specific gravity, is found in great abundance all along the junction of the coast plain and black prairie regions. It is worked to a small extent, but has no commercial value. The most important coal area is the semi-bituminous lignite belt of the trans-Pecos and lower Rio Grande regions, which is the direct geographical continuation of the late Cretaceous coals of New Mexico and Colorado. It is worked at Eagle Pass and Santa Toma, near Laredo. The beautiful marbles and other ornamental stones of the State are untouched, with the exception of the Llano county granite.

The amount and regularity of the rainfall decreases inland, the mean annual varying from fifty-two inches at Galveston to thirteen at El Paso in the extreme west and twenty-three at Mobeetie in the extreme north.

The coast plain and the black prairie regions have abundant rainfall for agricultural purposes. It decreases, however, to the west, and varies greatly in different years, sometimes being ample; but in 1885–86 it did not average ten inches. The precipitation is also very sudden, seldom lasting more than a few minutes at a time. Only 52 per cent. of the twenty inches of rainfall in the central region and west of it falls in the agricultural season, one-half being in summer and the remainder in autumn, so that it is equivalent to only fifteen inches in regions where the rainfall occurs in more propitious seasons. This condition is, however, especially favorable for grazing. The temperature varies greatly throughout the State, both in extremes and means. Fort Ringgold on the lower Rio Grande is the hottest point in the United States, except Key West, Fla. Its mean temperature is 73.4° Fahr.; that of El Paso is 63°, and of Mobeetie 54.6°. The prevalent winds are southerly and southeasterly, and blow constantly across the State, without which its summers would be unendurable. The Rio Grande valley is not subject to frosts. Snow seldom falls south of Galveston and Austin. In the Panhandle the winters are severe.

The arboreal flora of Louisiana and Arkansas extends into northeastern Texas, conformable with the coast plain, where, immediately south of the Colorado river, the great pine belt of the Atlantic and Gulf coasts terminates. The flora of the great plains region, principally consisting of nutritious grasses, enters the northwestern portion of the State and extends south to the 32d parallel and east to the 101st meridian. In the coast plain occur the long and short leaf pine, with many species of oak and hickory. The black prairie region is destitute of trees, except scattered individuals of live oak and the mesquite bush (*Prosopis glandulosa*). The broad river valleys of this region, however, are well-timbered with pecan, cypress, cottonwood, and several species of oak, and have a vigorous growth of smaller shrubs. West of the black prairie region the dwarfed, stunted trees are of little value except for fuel. The river valleys have the same character of trees as further east, but the rocky highlands are covered with scraggy bushes (chaparral) of oak, juniper, and cedar. The summits of the Guadalupe and Limpia ranges, in the trans-Pecos region, are clothed with forests of the yellow (*Pinus ponderosa*), flexible (*P. flexilis*), and nut pine (*P. edulis*), all of which attain great size. The valleys and several of the ranges in the last-named region, however, are destitute of trees. The entire Rio Grande valley, from El Paso to Brownsville, grows many species of cactus and other prickly, coriaceous shrubs. The grasses of the State are especially numerous in species, and are found most luxuriantly on the prairies of the lower coast, the central, and the plains regions. The lumber supply of the State comes entirely from the east Texas pine forests. The cedar, juniper, and mesquite are only utilized for fuel and fencing.

The black bear (*Ursus americanus*), panther (*Felis concolor*), and lynx (*Felis rufa*) are common to all parts of the State. The bison, wild horse, prongbuck (*Antilocapra americana*), coyote (*Canis latrans*), gray wolf (*C. lupus*), eastern prairie dog (*Cynomys ludovicianus*), and the lesser *Mammalia* of the great Rocky Mountain plains constitute the fauna of the northwestern part of the State, reaching into the western part of the central region. Their southern limit is approximately the 31st parallel. The highest ranges of the trans-Pecos region possess the unique avian and mammalian fauna of the Rocky Mountains, including the black-tailed or mule deer (*Cariacus macrotis*) and Rocky Mountain sheep, with a few Mexican species. The lower valleys have a mingling of the Mexican, Rocky Mountain, and great plain faunas. Along the valley of the Rio Grande, and extending northward in places, the sub-tropical fauna is Mexican, including the peccary (*Dicotyles torquatus*), armadillo (*Dasypus peba*), jaguar, (*Felis onca*), and ocelot (*Felis Pardalis*). Among the birds are the scissor-tail (*Milvulis forficatus*), Mexican eagle (*Polyborus cheriway*), chaparral cock (*Geococcyx viaticus*), and numerous other unique forms. The fauna of the humid wooded coast plain is the southwestern continuation and termination of that of the South Atlantic and Gulf States, with slight variations, and includes the Virginia deer (*Cariacus leucurus*), raccoon (*Procyon lotor*), opossum (*Didelphys virginiana*), alligator, etc. The black prairie region limits the last named fauna on the west, except in its wooded river bottoms. The central region possesses representatives of the great plains, Rocky Mountain, Mexican, and Louisiana faunas, but none of them cross it into other regions. It is a true transitional ground of most of the faunas of all temperate North America, east of the Pacific slope.

The total population in 1880 was 1,591,749 (837,840 males and 753,909 females), and in 1887 it was estimated to have risen to 2,215,000, giving 9.2 inhabitants to the square mile. Of the population in 1880, 1,477,133 were natives of the United States and 114,616 foreign born. There were 393,384 Negroes, 136 Chinese, 992 Indians, and 43,000 civilized aborigines (Mexicans). Of the entire population 522,133 persons were engaged in occupations as follows:—in agriculture (including stock raising), 359,317 (68.8 per cent.); in law, medicine, and other professions, 97,651 (18.7 per cent.); in trade and transportation, 34,909 (6.7 per cent.); in manufacturing and mining, 30,346 (5.8 per cent.). At the same date there were 3,153 prisoners, 2,276 idiots, 1,564 insane, 533 paupers, 1,375 blind, and 771 deaf. 13.9 per cent. of the native whites, 24.7 of the foreigners, and 75.4 per cent. of the Negroes—or 29.7 per cent. of the entire population—were unable to read or write. The population of Texas has increased more rapidly than that of any State in the Union except Kansas. The principal cities are Austin, (the capital), Galveston, San Antonio, Dallas, Houston, Fort Worth, and Waco. Eighty-four per cent. of the population is found east of the central region—the black prairie region (northern half) being the most densely populated, and the coast plain next. Between 1880 and 1887 there was a large flow of population into the trans-Pecos and plains regions, and during the last two years a decrease in the central region. The population consists principally of white natives of the Southern States, except in the counties of Brazos, Fort Bend, Harrison, Marion, Moore, and Washington, where it is of Negro race; in the counties of Fayette, Colorado, Gaudalupe,Comal, and Gillespie, where it is German; and along the Rio Grande, where it is Mexican. Population (1890), 2,235,523.

Of the United States Texas now ranks first in the production of cotton and cattle, second in sugar, sheep, mules, and horses, eighth in rice and pigs. The eastern third of the State, containing 80 per cent. of the entire population, is agricultural; the remainder is pastoral. The chief crops are cotton and Indian corn; wheat is grown in the northern part of the black prairie and eastern part of the central regions, sugar in the lower bottom lands of the Brazos and the Colorado, rice on the coast. The chief products for 1889 were cotton, 1,573,406 bales, valued at $64,688,795; corn, 67,629,851 bushels, valued at $24,722,296; wheat, 5,117,534 bushels, valued at $3,284,387; oats, 14,988,662 bushels, valued at $3,737,409; sweet potatoes, total value, $2,239,795; total value of sugar crop, $1,528,649; cultivated hay, $566,987; prairie hay, $935,852. The farms are usually of large size, and garden, orchard, and dairy products are entirely secondary to plantation crops. The southern part of the coast plain and the rest of the State west of the black prairie region are peculiarly adapted to pastoral pursuits, which are entirely separated from agriculture.

Official statistics of manufactures show that in 1889 there were 3,667 manufacturing establishments in the State, employing 24,052 hands. The capital invested was $32,865,938; materials used cost $31,268,962, and the value of the product was $54,128,946.

The exports are cotton, wool, and hides, most of which are shipped from Galveston or sent overland by rail. The chief imports are manufactured articles used in the State, also coal and railway material. Apart from a small retail trade along the border, there are no exports to the adjoining States. The principal seaport and commercial city is Galveston. The mileage of railways has increased from 1,048 in 1872 to 5,974 in 1882, to 7,034 in 1886 and to 9,325 in 1890.

The founders of the State made liberal provisions, by grants of land and revenue, for public education, but their intentions have not been carried out by subsequent legislation. Texas occupies the anomalous position of having the best school fund and the poorest school system in the United States. The public free school system proper consists of two normal schools for the preparation of teachers and numerous district schools, open for four months in the year. In most of the cities the State fund is supplemented by local taxation, and excellent schools are maintained. In 1890 there were 565,672 children within school age, and the cost of the maintenance of the whole system was $3,178,299. The actual enrollment in public schools was 402,707. About 25 per cent. of the scholastic population are colored. There are no schools for secondary education, except the high schools of a few cities. The State university is at Austin; it is abundantly endowed with lands, but does not receive the full benefit of its revenues. There is also a State agricultural and mechanical college, but technical training is made secondary.

The State government differs somewhat from those of the rest of the Union, owing to the fact that it has had to adapt itself to the administration of the great public domain, by which most of the public institutions are supported and works of internal improvement accomplished, and because much of the attention of the Government has been necessarily diverted to the protection of its extensive frontier. The executive government consists of a governor, comptroller, treasurer, commissioner of the general land office, and superintendent of education, elected biennially, with an attorney-general and a secretary of state, appointed by the governor. The judiciary consists of two courts of final appeal, one for criminal, the other for civil business, forty itinerant higher courts for the trial of penal offenses and civil suits; courts for misdemeanors and minor civil cases in each county; and innumerable justices' courts for first hearings. The legislature consists of 31 senators elected for four years, and 106 members of the house of representatives elected for two years. It is restricted by the constitution to biennial sessions of ninety days each. The State is divided into eleven congressional and 47 judicial election districts. It is also divided into 245 counties, 40 of which have no population, or insufficient population to be organized. Each county is divided into four commissioners' precincts, and a varying number of school, election, and justices' precincts. The State has always maintained a corps of troops, formerly for protection against Indians, but now for preserving order in the unorganized counties. It has institutions for the blind, deaf and dumb, and insane. The prison system is far superior to that of some of the Southern States, but still very imperfect. The bonded debt of the State on January 1, 1890, was $6,802,259, and its taxable wealth $650,412,401. The aggregate debt of all the counties and cities was $6,839,739. The homestead and exemption laws are unusually liberal to the debtor. The new State capitol at Austin was finished in May, 1888, but was not formally accepted until the close of the year. The building is 566½x228$\frac{10}{12}$ in dimensions and 311 feet in height. It is second in size to the capitol at Washington in the United States and the seventh largest building in the world. It is constructed of brick and granite and cost nearly four millions of dollars.

The upper Rio Grande valley was visited in 1580-83 by the Spaniards, who established missions among the settled Indians near El Paso and Santa Fé. The first white settlement was made by La Salle at Lavaca, on the coast, in 1685. The country was inhabited by Indians of various tribes, both savage and agricultural,most of whom are now extinct, except the so-called "Mexican" population of the Rio Grande. From 1583 to 1794 many missions were established by Roman Catholic missionaries among the Indians, who were completely alienated from their original language, religion, domestic habits, and tribal relations. After the purchase of Louisiana from the French in 1803 Anglo-American adventurers began to cross into Texas from the United States. In 1821, when Mexico threw off the Spanish yoke, Texas and Coahuila constituted a state of the republic. It was shortly after this that the first American colonists were permitted to enter the territory under government patronage. Within ten years over 20,000 had settled between the Sabine and the Colorado. In 1830 the Mexican Government placed them under military rule, from which, with accompanying impositions, originated the war of Texan Independence. The Anglo-Americans were assisted by volunteers from the United States, and the war was terminated by the defeat of the Mexicans under General Santa Anna at San Jacinto, April 21, 1836. From 1837 to 1845 Texas was an independent republic. It was admitted to the United States on December 29, 1845, in spite of the protests of Mexico, and a war with that country ensued. The new State sold to the United States Government for $10,000,000 all the territory west and north of the present boundaries between the headwaters of the Rio Grande and the Arkansas, but it reserved the control and disposal of the public lands within its borders, which have proved a magnificent source of revenue, and also the right to divide into five States, should future growth and development justify it. By a small majority the State seceded from the Union in 1861. In 1868 a new constitution was adopted. In 1874 the Kiowa and Comanche Indians, who had prevented the settlement of the central and plains regions from the earliest times, were subjugated.

TEXTILES. This word is applied to all fabrics which are woven in a loom, of whatever material they may be made, and whether the woven stuff be plain or figured. The simplest and earliest process of weaving was managed thus. The ground of the future stuff was formed by a number of parallel strings called the *warp*, having their upper ends attached to a horizontal beam and drawn taut by weights hung from their lower ends. On the number of the warp strings the fineness and width of the stuff depended. The strings of the *weft* were interlaced at right angles to those of the warp, and the combination of the two formed the woven stuff or *web*. The *weft* was so called from its being "wafted" in and out of the warp; it is also often called the *woof*, though more correctly the woof is the same as the web or finished stuff. The threads of the weft were wound round a sort of bobbin on a pivot which was made to revolve inside a hollow boat-shaped piece of wood pointed at both ends so as to pass easily between the threads of the warp. This is called the *shuttle*. The thread passed out through a hole in the side of the shuttle, the inner pivot revolving as the thread was delivered between the strings of the warp. In order to make the weft interlace in the warp some of the upright strings were pulled forward out of the general plane in which the warp hung; this was done in the simplest way by a reed, which divided the threads into two sets called *leaves* and thus formed an opening called the *shred*, through which the shuttle could pass. Another way, applicable to more complicated ornamental weaving, was to have a series of threads attached to the warp at right angles, so that the weaver could pull any of the warp threads away from the rest, thus allowing the shuttle to pass in front of or behind any special warp-strings. By a very simple mechanical contrivance these threads were worked by a foot treadle, thus leaving the weaver's hands free to manage the shuttle. In the simplest sort of weaving first one and then the other half of the warp threads were pulled forward, and so a plain regularly interlaced stuff was woven. The next stage was to make a cloth with colored stripes, by using successively two shuttles containing different-colored threads. In a checkered cloth the warp was made of two-colored threads stretched in successive bands, and the cross stripes of the weft were woven in by the two shuttles. To form a more complicated pattern the weft must not cross the warp alternately: the design is formed by either the warp or the weft predominating on the surface in certain places. In all cases each thread of the weft must be driven home to its place after each stroke of the shuttle. In the earliest times this was done by beating the weft with a wooden sword-shaped implement introduced between the strings of the warp; but later a heavy comb-shaped tool was used, the teeth of which passed between the warp and drove home at one blow a longer length of the weft.

Some simple form of weaving seems to have been practiced by prehistoric man at a very early stage of development. Wool appears to have been the first substance used, as no skill is required to prepare it for spinning. Weaving was specially the duty of women, and even in the Middle Ages in Europe it was, in some countries, considered a specially feminine employment. The Egyptians were famed for the beauty of their woven stuffs, and almost incredible stories are related of the fineness of their linen, such as a pallium sent by King Amasis to the Spartans, which, Herodotus says, was made of yarn containing no less than 360 threads; the figures woven on this were partly of cotton and partly of gold thread.

The Phœnicians were celebrated for their weaving, as for their skill in other arts. Their purple linen, dyed with the murex, was specially valued; Tyre and Sidon were the chief places where this was made. Babylon, Carthage, Sardis, Miletus, and Alexandria were all famous seats of textile manufacture in the time of Herodotus. Though no specimens of Assyrian textiles remain, some notion of their richness of ornament and the styles of their patterns may be gained from the minute representations of rich dresses worn by kings and other important personages in the sculptured wall-reliefs from Nineveh which are now in the British Museum.

Our knowledge of Greek textiles, in the almost complete absence of any existing specimens, is chiefly derived from the descriptions of various classical authors. Again, recent excavations at Orchomenus and Tiryns have brought to light examples of ceiling and wall decoration the motives of which are obviously derived from textile patterns. The poems of Homer are full of descriptions of woven stuffs of the most magnificent materials and design, used both for dresses and for tapestry hangings. In later times the most important examples of rich woven work of which we have any record were certain peploi made to cover or shade the statues of the deities at Athens, Olympia, Delphi, and other famous shrines.

The Romans under the late republic and the empire possessed immense stores of the most magnificent textiles of every description, such as the splendid collection of tapestry which Rome inherited along with the other art treasures of Attalus II. of Pergamum (second century B.C.) A very costly cloth of gold was called by the Romans "attalica," after Attalus. Examples of large prices given by Romans for woven stuffs are recorded by Pliny. Metellus Scipio bought some hangings from Babylon for 800,000 sesterces, and other similar stuffs were bought by Nero for 4,000,000 sesterces. Costly tapestry from Babylon is mentioned by Plautus, Silius Italicus, and Martial. Virgil mentions woven tapestries with figures of Britons being used at theatrical shows: "Purpurea intexti tollant aulæa Britanni." Other tapestries with scenes from the story of Theseus and Ariadne are mentioned by Catullus. A large quantity of very remarkable woven stuffs has recently been found in tombs at Ekhmin (Panopolis) in Middle Egypt. More than 300 pieces have been bought for the South Kensington Museum. They are of various dates, apparently ranging from the fourth to the sixth or seventh century A.D.

From the sixth to the thirteenth century Byzantium became the capital of all the industrial arts, and in none is its influence more obvious than in that of weaving. There the arts of ancient Greece and of old Rome met and were fused with the artistic notions of ancient Egypt, Assyria, Persia, and Asia Minor, and this combination produced a fresh and very active art spirit, which for many centuries dominated the whole civilized world. As regards weaving, this new development was strengthened by the introduction of silk into Europe in the reign of Justinian, and many specimens of early silk fabrics have lasted down to the present time, partly through their being safe against moths. The silken stuffs found in the tombs of Charlemagne and other kings, though perhaps not themselves as early as the sixth century, show one class of design used in Byzantium in the time of Justinian. The manufacture of these rich fabrics was carried on, not only in Byzantium, but also in many towns of Greece proper, such as Athens, Thebes, and Corinth, all of which were specially famed for their silk textiles. During the same time, the sixth to the twelfth century, Bagdad, Damascus, Ispahan, and many other towns in Persia and Syria were producing woven stuffs of the richest materials and designs; names of reigning caliphs are sometimes mingled with Arabic sentences from the Koran and other sacred books, which are introduced freely among the intricate patterns with the most richly decorative effect.

According to the usual story, Roger of Sicily, who in 1147 made a successful raid on the shores of Attica, took Athens, Thebes, and Corinth, and carried off as prisoners a number of Greek weavers, whom he settled at Palermo and made the founders of the royal factory for silk weaving. This story is doubtful, for the Saracenic inhabitants of Sicily had apparently been producing fine silken stuffs long before the twelfth century. In part, however, the story may be true; certainly an impetus was given to the weaving industry of Palermo in the twelfth century, and for about two centuries Sicily became the chief seat in Europe for the production of the finest woven stuffs. The Sicilian silks of the twelfth to the fourteenth century were mostly used for ecclesiastical vestments, altar frontals, and the like; and the fact that examples have survived in almost all countries of Europe shows how important and far-reaching a trade in them must once have been carried on. The favorite designs were the sun breaking through a cloud whence rays of light are issuing, or conventionally treated ships, fountains, islands, castles, and an immense variety of birds and beasts, such as swans, mallards, eagles, lions, cheetahs, hounds, giraffes, antelopes, and others. Some specimens have siren-like female forms, with floating hair, casting nets, leaning down from palm trees, or issuing from shells. Others, rather later in style, have winged angel-like figures. In many cases the Assyrian sacred tree and its guardian beasts occur, and very frequently borders with sham Arabic letters are introduced—a survival of the time when real sentences were woven into the fabrics of Persia and Egypt, probably intended as a visible sign that the stuff was the genuine product of Saracenic looms.

In the fourteenth century the chief center of fine silk weaving was transferred from Palermo to Lucca, Florence, Milan, Venice, and other towns in northern Italy, and a different class of design, less rich in fancy, but scarcely less beautiful in effect, came into vogue. The designs of these fourteenth and fifteenth century textiles were chiefly conventional adaptations of natural foliage and flowers, arranged with great beauty of line and wealth of decorative effect; among the most beautiful is scroll-work of vines with graceful curving lines of leaf and tendril. At this time Venice contained a large number of Oriental craftsmen in all the industrial arts, and very beautiful stuffs were woven there with designs of mingled Oriental and Italian style—probably the work of Mohammedan weavers.

In all these Oriental, Sicilian, and early Italian stuffs gold thread is used in a very lavish and effective way. It was made very skillfully, the richest effect being produced with little metal by thickly gilding fine vellum skins with gold leaf; the vellum was then cut into very thin strips and wound round a thread of silk or hemp so closely as to look like a solid gold wire. In classical times attalica and other gold stuffs were made of solid gold wire beaten out with the hammer. Masses of this fine gold wire have been found in the tombs of Egypt, Greece, and Etruria, the metal having lasted long after all the rest of the stuff had crumbled into dust. In 1544 the grave of the wife of Honorius was opened and thirty-six pounds of gold thread taken out of it and melted. Throughout the Middle Ages cloth of gold was largely employed for ecclesiastical and royal purposes. Westminster Abbey still possesses a magnificent gold cope of the fifteenth century, in almost perfect brilliance of preservation. In the thirteenth and fourteenth centuries Cyprus and Lucca were specially famed for their gold stuffs, and the royal inventories of France and England show that the kings possessed stores of this to an immense value. Various names were at different times given to textiles which were wholly or in part woven in gold, such as *ciclatoun* (a word of obscure origin), *baudekin* (from Baldak or Bagdad), *nak*, and *tissue*. *Samite* or *examite* (ἕξ μίτοι) was so called because the weft threads were only caught and looped at every sixth thread of the warp, lying loosely over the intermediate part. Mediæval samite was sometimes made of gold; if of silk it was a variety of satin, called *satin of six*. Modern satin usually has its weft looped in less closely—*satin of eight* or *ten*.

Although throughout the Middle Ages the finer stuffs used in England were to a great extent the product of foreign looms, there was no lack of native textiles, many of which were of great beauty. In the use of the needle the women of England were especially skillful, and rich English embroideries were much exported, even into Italy, from the twelfth to the fourteenth century, and were esteemed more highly than the productions of any other country. Pictures in English MSS. show that the low loom was mainly used—this being the most convenient for ordinary weaving. England was specially celebrated for its wool and woolen stuffs, and even at the present day English wool is used for the Gobelin tapestries; in the fifteenth and sixteenth centuries it was largely imported into Flanders. In the fourteenth century Bath produced the finest woolen cloth, and that of Worcester was equally celebrated; in the fifteenth century the production of woolen stuff was a great source of wealth to Norwich and other towns in the eastern counties. A special sort of woolen yarn took its name from Worstead in Norfolk, where it was made; it had a closer and harder twist than most woolen thread, and thus could be made up into cloth of special fineness, which was used for chasubles and other vestments, as is recorded in the inventories of York, Exeter, and other cathedrals.

Space will not allow a description of the textile work in each separate country. That of Italy and the East was by far the most important throughout the Middle Ages. Even Chinese textiles of gold and silk were imported into the west of Europe, and were sometimes used for ecclesiastical purposes. Mediæval vestments of Chinese stuff still exist, the shape and added borders of which show that they date from as early as the fourteenth century. These fabrics exactly resemble in design and workmanship some which are woven in China at the present day. A very interesting survival of the mediæval style of weaving exists in Sweden and other Scandinavian countries. Articles of dress, counterpanes, table-covers, and the like are woven by the peasantry in a simple, highly decorated way, with patterns which have altered little during the last three or four centuries. Though coarse in texture, many of these are of great artistic beauty; nothing but an occasional use of harsh colors shows any sign of decadence of style. Strong marks of Oriental influence are visible in these fine patterns, but the method of weaving is purely native—probably very like what the edicts of Louis IX. call "tapisserie nostrez." Very beautiful fabrics are still produced in India, old designs being followed, and woven in the simplest form of loom. The cut shows an example of a modern Indian loom used by the hill weavers. In such looms the richest materials, such as gold and silk, and the most elaborate patterns are woven, often by traveling weavers who can set up their whole apparatus in a very short time.

Carpet weaving was essentially an Oriental art, and was the natural product of a dry mudless country, where little furniture was used and the shoes were removed on entering a building. Till the sixteenth century carpets were almost unknown in France and England, except for royal personages and for the sanctuaries of cathedrals and important churches. They were first employed in England for domestic purposes by Queen Eleanor of Castile and her suite, in the latter part of the thirteenth century. Though few examples of Oriental carpets exist earlier in date than the fifteenth century, yet the manufacture was carried on in the highest state of perfection centuries before. An example of the fourteenth century is preserved in a private collection at Vienna; it was originally made as a hanging for the Kaaba at Mecca. These beautiful Oriental pile carpets are among the most perfect productions of the weaver's art, and till the sixteenth century were masterpieces of design and splendor of color. Usually they were woven of wool or of camels' or goats' hair, with a separate warp and weft of flax; but many magnificent carpets were also made of silk mixed with gold thread. Pile carpets are woven in a very different way from ordinary textiles: short tufts of wool or silk are knotted on the warp so that the ends of the threads which form the pattern project, and these are cut down by shears to a uniform surface, thus forming a sort of textile mosaic. Each row is firmly fixed by a shoot of linen weft-thread thrown across the web, and then carefully beaten down with the batten.

Various classes of ornament occur in these magnificent Oriental carpets; one variety has stiff geometrical patterns, the motives of which appear to be taken from mosaics or tiles. Another and still more beautiful sort, manufactured especially at Ispahan, has elaborate flowing designs of flower forms, sometimes mixed with figures of cheetahs, lions, antelopes, and birds, in a few cases combined with human figures. Mr. W. Morris, in his valuable lecture on textile fabrics (London, 1884), traces three stages of design—first, a pure flowing style, closely resembling the early stucco mural reliefs of Cairo; secondly, a similar style blended with animal forms; and thirdly, a purely floral style, flowing in its lines and very fantastic and ingenious in its patterns; this last he thinks belongs to about the time of Shah Abbas, and lasted from 1550 to 1650—the culminating period of Oriental art. At the present day the influence of European taste is rapidly destroying this survival of the best class of design, and is introducing the most harsh and discordant coloring in place of the glorious rich hues of the earlier Oriental weavers.

Though no existing specimens can be pointed out, it appears probable that the "tapisserie Saracenois" of Louis IX.'s edicts (1226-1270) refers to pile carpets made by French weavers after the Oriental fashion. The same edicts for the regulation of the textile industry mention two other classes of manufacture, "tapisserie à la hautelisse," *i.e.* what we call tapestry, and "tapisserie nostrez," "native stuff," probably resembling the coarse but effective patterned fabrics for aprons and dresses which are still woven by the peasantry near Rome, in the Abruzzi mountains, and elsewhere in Italy, and in Scandinavia. The making of tapestry (Gk. ταπης), like the weaving of pile carpets, differs from ordinary fabric in that no visible weft is thrown completely across the loom, but the design is formed by short stitches knotted across the warp with a wooden needle called a *broach.* It is very probable that many of the woven hangings used in ancient Egypt, Greece, and other countries were true tapestry; but little is known on this point. Till after the twelfth century, in northern Europe, embroidery seems to have served the place of tapestry, while in the south of Europe and in Oriental countries its place was supplied by the rich silken textiles and pile carpets mentioned above. In the fourteenth century tapestry began to be largely made, especially in Flanders, where the craft of weaving became very important at an early time. The designs on the very few existing samples of fourteenth century tapestry closely resemble those of contemporary wall painting. A characteristic early specimen in the Louvre has rows of medallions, each containing a scene from the life of St. Martin, with two or three figures treated in a very simple decorative way. The spaces between the circles are filled up with a stiff geometrical ornament. To the end of the fourteenth century belongs the magnificent tapestry in Angers cathedral, on which are represented scenes from the Apocalypse; these were made at Arras, the chief seat of the tapestry manufacture, both for quantity and quality. Another magnificent series of arras work is preserved in Rheims cathedral, with designs from the history of Clovis; these date from the middle of the fifteenth century. In the fourteenth century Flanders produced enormous quantities of woven stuffs. At that time twenty-seven streets were occupied by the weavers of Ghent; in 1382 there were 50,000 weavers in Louvain; and at Ypres there is said to have been a still larger number. From about 1450 to 1500 was the golden age for tapestry, especially in Bruges and Arras, where large quantities of the most magnificent historical pieces were woven from designs supplied by painters of the Van Eyck school. A very beautiful example of this class exists at Hampton Court. Other fine examples exist in the Cluny, Bern, and other museums, and especially in Madrid—in the royal collection and in that of the duke of Alva—and elsewhere in Spain.

In the sixteenth century the art began to decline; very slight symptoms of decadence are visible in the beautiful tapestries with Petrarch's *Triumphs* in the South Kensington Museum—most gorgeous pieces of textile art of the richest decorative effect. These were worked very soon after 1500. The influence of Raphael and his school succeeded that of the fifteenth-century Flemish painters, and was utterly destructive of true art value in tapestry. This new style, which reduced the art to a feeble copyism of painting, gave the death-blow to the production of really fine tapestry. Brussels became the chief place for the manufacture after the taking of Arras by Louis XI. in 1477, and its weavers with wonderful skill imitated any sort of painting that was put before them. Cartoons were drawn by several of Raphael's pupils, such as Giulio Romano and Giovanni da Udine, and by Mabuse, Michiel Coxcie, Bernard van Orley, and other Italianized Flemish painters.

In 1539 Francis I. founded a factory for tapestry at Fontainebleau, and soon after other looms were set up in Paris, examples from which still exist and show a rapid degradation of style. In 1603 a new factory was started in Paris under royal patronage, in the workshop of a family of dyers named Gobelin, after whom the new factory was named (see GOBELIN). The Gobelin looms were first worked by weavers from Flanders, who soon taught the mysteries of the craft to a number of French workmen. Cartoons were supplied by Simon Vouet and other distinguished French painters. In the reign of Louis XIV. a great impulse was given to the factory, and from 1667 the whole establishment became the property of the crown. Louis XIV.'s minister, Colbert, did much to encourage this and other industries. Charles Le Brun, the painter, was made director of the works, and a number of artists prepared the cartoons under his supervision. In the eighteenth century Coypel, Jouvenet, Boucher, Watteau, and many other popular painters made designs, often of great size and elaboration, for the Gobelin looms, but all in the very worst possible taste. Other taspestry looms were worked in the eighteenth century at Aubusson, Felletin, and other places in France.

High-warp looms appear to have been worked in England in the fifteenth century, though by far the greater part of the rich stores of tapestry in this country came from Flanders. One very beautiful example of English work of this time exists in St. Mary's Hall at Coventry; it represents the marriage of Henry VI. Part of another series with the marriage of Henry VII. is preserved in a house in Cornwall. In the latter part of the fifteenth and the first half of the sixteenth century enormous sums were spent by the rich in England on Flemish tapestry. Cardinal Wolsey's private accounts and inventories, which still exist, give an astonishing picture of the wealth which he lavished on the adornment of his palace at Hampton Court. In 1522 he bought 132 large pieces of Brussels tapestry, woven with scriptural subjects, and mostly made to order, so as to fit exactly the various wall spaces. He also bought large quantities of costly Oriental carpets. This example of the wealth of textile work possessed by one rich prelate will give some notion of what England and other countries possessed in the sixteenth century.

In the reign of James I. tapestry looms were set up at Mortlake, and the industry was carried on during the following reign under the direction of the painter Francis Crane. Charles I. introduced skilled weavers from Oudenarde in Belgium, and the whole existing series of cartoons by Raphael were copied on the Mortlake looms. Most of the Mortlake tapestry has distinct marks, such as the shield of St. George with F. C. (F. Crane). Some pieces are inscribed "Car. Re. Reg. Mortl.," (Carolus rex regnans). Though closed during the Commonwealth, the Mortlake fabrique was again worked after the Restoration until the death of Crane in 1703. In the eighteenth century tapestry was woven on a small scale in Soho and at Fulham, and within recent years a new royal fabrique has been established at Windsor, where very costly and skillful weaving in the pictorial Gobelin style is carried on. The only modern tapestry which has any of the merits of the best old productions is that made on a small scale by Mr. William Morris at Merton Abbey (Surrey), where work of the highest beauty has been produced.

As in England, by far the greater part of the tapestry used in Italy was a Flemish import. But in the sixteenth century, under the patronage of the dukes of Ferrara, tapestry looms were set up in Ferrara; these were, however, worked by Flemish weavers, and closely resemble contemporary tapestry woven at Brussels. Other fabriques were established in Florence by the Medici princes, and continued to be worked till the end of the seventeenth century. Factories for tapestry existed also at Venice, Turin, and other northern cities, but the industry was purely an exotic, and never attained to any great importance. Since the pontificate of Clement XI., in 1702, a papal factory for tapestry has existed in Rome, and is still carried on in the Vatican. The papal looms have produced a large number of most costly and elaborate copies of celebrated paintings, executed with wonderful skill, but utterly worthless as works of art.

The South Kensington Museum possesses the best and most illustrative collection of woven fabrics of various dates. The church of St. Mary, at Dantzic, has a magnificent collection of early textiles, mostly used for vestments. Fine examples of early tapestry exist in the cathedrals of Rheims, Bruges, Tournay, Angers, Beauvais, Aix, Sens, and in the church of St. Rémy, at Rheims. Other fine collections are preserved in the Louvre, the Cluny Museum, at Chartres, Amiens, Dijon, Orleans, Auxerre, Nancy, Bern, Brussels, Munich, Berlin, Dresden, Vienna, and Nuremberg. In Italy the richest collections (mostly of later tapestry) are those of the Vatican, the Pitti, the Bargello, Palazzo del Tè at Mantua, Turin (royal palace), Milan (royal palace), Como (cathedral), and the museum of Naples. The Spanish collections have been already mentioned. In England, besides the South Kensington Museum, fine tapestries exist in the palaces of Windsor and Hampton Court. Those formerly in the House of Lords were destroyed in the fire of 1834. St. Mary's Hall at Coventry contains the finest examples of the fifteenth century.

TEZA, or TÁZÁ. See MOROCCO.

THACKERAY, WILLIAM MAKEPEACE, one of the greatest of English authors and novelists, son of Richmond Thackeray (Mrs. Richmond Thackeray was born Miss Becher), and grandson of W. R. Thackeray of Hadley, Middlesex, was born at Calcutta on July 18, 1811. Both his father and grandfather had been Indian civil servants. His mother, who was only nineteen at the date of his birth, was left a widow in 1816, and afterward married Major Henry Carmichael Smyth. Thackeray himself was sent home to England from India as a child, and went to Charterhouse, since his time removed to Godalming from its ancient site near Smithfield. In February, 1829, Thackeray went to Trinity College, Cambridge, and in that year contributed some engaging lines on *Timbuctoo*, the subject for the prize poem, to a little university paper called *The Snob*, the title of which he afterward utilized in the famous *Snob Papers*. In 1832 he came of age, and inherited a sum which Trollope's book describes as amounting to about five hundred a year.

The money was soon lost. His first regular literary employment after the loss of his patrimony was on *Fraser's Magazine*, in which in 1837–38 appeared *The History of Mr. Samuel Titmarsh and the Great Hoggarty Diamond*, a work filled with instances of the wit, humor, satire, pathos, which found a more ordered if not a fresher expression in his later and longer works. In 1840 came out *The Paris Sketch Book*. Much of it had been written and published at an earlier date, and in the earlier writings there are some very curious divagations in criticism. The book contains also a striking story of card-sharping, afterward worked up and put into Altamont's mouth in *Pendennis*, and a very powerful sketch of a gambler's death and obsequies. Three years before, in 1837, Thackeray had begun, in *Fraser*, the *Yellowplush Papers*, with their strange touches of humor, satire, tragedy (in one scene, the closing one of the history of Mr. Deuceace), and their sublimation of fantastic bad spelling (M'Arony for macaroni is one of the typical touches of this); and this was followed by *Catherine*, a strong story, and too disagreeable perhaps for its purpose, founded closely on the actual career of a criminal named Catherine Hayes, and intended to counteract the then growing practice of making ruffians and harlots prominent characters in fiction. There soon followed *Fitz-Boodle's Confessions and Professions*, including the series *Men's Wives*; and, slightly before these, *The Shabby Genteel Story*, a work interrupted by Thackeray's domestic affliction and afterward republished as an introduction to *The Adventures of Philip*, which took up the course of the original story many years after the supposed date of its catastrophe. In 1843, and for some ten years later, Thackeray was writing for *Punch*, and the list of his contributions included among many others the celebrated *Snob Papers* and the *Ballads of Policeman X*. In 1843 also came out the *Irish Sketch Book*, and in 1844 the account of the journey *From Cornhill to Grand Cairo*, in which was published the excellent poem of *The White Squall*. In 1844 there began in *Fraser* the *Memoirs of Barry Lyndon*, called in the magazine *The Luck of Barry Lyndon, a Romance of the Last Century*. Besides the contributions to *Punch* specially referred to, there should be noticed *Punch's Prize Novelists*, containing some brilliant parodies of Edward Lytton Bulwer, Lever, Mr. D'Israeli (in *Codlingsby*, perhaps the most perfect of the series), and others. Among minor but admirable works of the same period are found *A Legend of the Rhine* (a burlesque of the great Dumas' *Othon l'Archer*), brought out in a periodical of George Cruikshank's, *Cox's Diary* (on which has been founded a well-known Dutch comedy, *Janus Tulp*), and the *Fatal Boots*. This is the most fitting moment for mentioning also *Rebecca and Rowena*, which towers, not only over Thackeray's other burlesques, excellent as they are, but over every other burlesque of the kind ever written. Its taste, its wit, its pathos, its humor are unmatchable; and it contains some of the best songs of a particular kind ever written. In 1846 was published the first of twenty-four numbers of *Vanity Fair*, the work which first placed Thackeray in his proper position before the public as a novelist and writer of the first rank. It was completed in 1848, when Thackeray was thirty-seven years old.

The publication of *Vanity Fair* was followed by *Pendennis*, *Esmond*, and *The Newcomes*, which appeared respectively in 1850, 1852, and 1854.

In 1851 Thackeray had written *The English Humorists of the Eighteenth Century*, delivered as a series of lectures at Willis' Rooms in the same year, and redelivered in the United States in 1852 and 1853, as was afterward the series called *The Four Georges*. Both sets were written for the purposes of lecturing. In 1857 Thackeray stood unsuccessfully as a parliamentary candidate for Oxford against Mr. Cardwell, and in the same year appeared the first number of *The Virginians*, a sequel to *Esmond*. This is a most unequal work—inferior, as sequels are apt to be, to *Esmond* as an historical romance, less compact and coherent, prone to divagation and desultoriness, yet charming in its lifelikeness, in the wit and wisdom of its reflections, and in its portrait of Beatrix grown old. The last number of *The Virginians* came out in 1859, and in the same year Thackeray undertook the editorship of the *Cornhill Magazine*. This was a task which, as readers of his *Roundabout* paper "Thorns in the Cushion" will remember, the kindliness and sensitiveness of his disposition made irksome to him, and he resigned the editorship in April, 1862, though he continued to write for the magazine until he died. In the *Cornhill* appeared from his pen *Lovel the Widower*, previously written, with different names for some of the personages, in dramatic form; *The Adventures of Philip*; the *Rounbabout Papers*; and the story, unhappily never finished, called *Denis Duval*. *Lovel the Widower*, changed from the dramatic to the narrative form, remains a piece of high comedy in which the characters are indicated rather than fully worked out, with a bold and practiced touch. It contains some references to Thackeray's early and unfortunate newspaper speculations, and it was provided by the author with illustrations which, as in others of his books, have a value which is entirely their own in furnishing, as it were, a far completer commentary on the letterpress than could have been given by any draughtsman, however perspicacious and finished, who approached the pictorial representation of the characters from the outside. To the general statement thus indicated an exception should be made in the case of Doyle's illustrations to *The Newcomes* and to *Rebecca and Rowena*. On the other hand, not even Doyle could have matched the fun and spirit of Thackeray's own illustrations to another burlesque story, one of his best, *The Rose and the Ring*. The *Roundabout Papers*, a small storehouse of some of Thackeray's best qualities as an essayist, came out in the *Cornhill Magazine* simultaneously with *Lovel the Widower* and with *The Adventures of Philip*. Among them is one differing in form from the rest, called *The Notch in the Axe—a Story à la Mode*. It is an almost perfect specimen of the author's genius for burlesque story-telling; but it contains an odd instance, which a careful reader will not fail to discover, of the odd habit of inaccuracy of which Thackeray himself was conscious. *The Adventures of Philip* is, as has been before said, in the nature of a sequel to or a completion of *A Shabby Genteel Story*. As with the other direct sequel, it is a work of great inequality. It contains scenes of humor, pathos, satire, which rank with Thackeray's best work; some old friends from others of the novels make brief but pleasant reappearances in its pages; there are fine sketches of journalistic, artistic, and diplomatic life, and the scene from the last-named in Paris is inimitable. *Denis Duval*, which reached only three numbers, promised to be a first-rate work, more or less in the *Esmond* manner. The author died while it was in progress, on the eve of Christmas Day, 1863. He was buried in Kensal Green, and a bust by Marochetti was put up to his memory in Westminster Abbey. Thackeray's performances in poetry formed a small but not the least significant part of his life's work. The grace and the apparent spontaneity of his versification are beyond question. Some of the more serious efforts, such as *The Chronicle* *of the Drum* (1841), are full of power, and instinct with true poetic feeling. Both the half-humorous, half-pathetic ballads and the wholly extravagant ones must be classed with the best work in that kind; and the translations of Béranger are as good as verse translations can be. He had the true poetic instinct, and proved it by writing poetry which equaled his prose in grace and feeling.

THALBERG, SIGISMOND, a celebrated pianist and composer for that instrument, was born at Geneva in 1812 (May 5th or January 7th). He made his first appearance as a pianist at Prince Metternich's, Vienna, in 1826, and published his first composition—a *Fantasia on Airs from "Euryanthe"*—in 1828, but it was not until 1830 that he was first fairly introduced to the public, with such brilliant success that from that time forward his only rival was Liszt. Besides his pianoforte compositions, which are almost innumerable, Thalberg produced two operas—*Cristina*, which proved a complete failure, and *Florinda*, which fared but little better at Her Majesty's Theater in 1851. He played in London for the last time in 1863, and afterward retired to his estate near Naples. He died at Naples, April 27, 1871.

THALES OF MILETUS, son of Examyus and Cleobuline, born 640 B.C., is universally recognized as the founder of Greek geometry, astronomy, and philosophy. He is said by Herodotus and others to have been of Phœnician extraction, but the more common account (see Diogenes Laertius) is that he was a native Milesian of noble birth. The high estimation in which he was held by his contemporaries is shown by the place he occupied as chief of the seven "wise men" of Greece; and in later times among the ancients his fame was quite remarkable. It is well known that this name (σοφός) was given on account of practical ability; and in accordance with this we find that Thales had been occupied with civil affairs, and indeed several instances of his political sagacity have been handed down. Of these the most remarkable is the advice, praised by Herodotus, which he gave to his fellow-countrymen "before Ionia was ruined,"—"that the Ionians should constitute one general council in Teos, as the most central of the twelve cities, and that the remaining cities should nevertheless be governed as independent states" (Herod., i. 170). It is probable, however, that in the case of Thales the appellation "wise man," which was given to him and to the other six in the archonship of Damasius (586 B.C.), was conferred on him not only on account of his political sagacity, but also for his scientific eminence (Plut., *Solon*, c. 3). To about the same time must be referred his celebrated prediction of the eclipse of the sun, which took place on May 28, 585 B.C.

The wonderful fame of Thales among the ancients must have been in great part due to this achievement, which seems, moreover, to have been one of the chief causes that excited among the Hellenes the love of science which ever afterward characterized them. Thales seems not to have left any writings behind him, though as to this there appears to be some doubt.

But the characteristic feature of the work of Thales was that to the knowledge thus acquired he added the capital creation of the geometry of lines, which was essentially abstract in its character. The only geometry known to the Egyptian priests was that of surfaces, together with a sketch of that of solids, a geometry consisting of some simple quadratures and elementary cubatures, which they had obtained empirically. Thales, on the other hand, introduced abstract geometry, the object of which is to establish precise relations between the different parts of a figure, so that some of them could be found by means of others in a manner strictly rigorous. This was a phenomenon quite new in the world, and due, in fact, to the abstract spirit of the Greeks. Thales died 546 B.C.

THALLIUM, one of the rarer elements of chemistry. Its discovery is one of the outcomes of Bunsen and Kirchhof's method of spectrum analysis. The chemical character of thallium presents striking peculiarities. Dumas once called it the "*ornithorhynchus paradoxus* of metals." As an elementary substance it is very similar in its mechanical and physical properties to lead; like lead it forms an almost insoluble chloride and an insoluble iodide. But the hydroxide of thallium, in most of its properties, comes very close to those of the alkali metals; it is strongly basilous, forms an insoluble chloroplatinate, and an alum strikingly similar to the corresponding potassium compounds. Yet, unlike potassium or lead, it forms a feeble basic sesquioxide similar to manganic oxide Mn_2O_3.

Traces of thallium exist in many kinds of pyrites, as used for vitriol-making. The only known mineral of which it forms an essential component is the "crookesite" of Skrikerum, Smaland, Sweden, which, according to Nordenskiöld, contains 33.3 of selenium, 45.8 of copper, 3.7 of silver, and 17.2 of thallium in 100 parts. Crookesite, however, is scarce. The best raw materials for the preparation of thallium are the flue-dusts produced industrially in the roasting of thalliferous pyrites and the "chamber-muds" accumulating in vitriol-chambers wrought with such pyrites; in both it is frequently associated with Selenium.

THAMES, the most important river in Great Britain, has its source in several streams on the Gloucestershire border, the main one having its rise in the parish of Coates, three miles southwest of Cirencester. The upper part of the river, until the junction with the Thame near Dorchester, is generally called the Isis, a usage to which Camden perhaps gave currency. He derives the word Tamesis or Thames from the junction of the names of the two rivers, the Thame and Isis. The total length of the river from Thames Head to London Bridge is 170 miles, and to Sheerness 228 miles. It drains an area of 6,100 miles. It becomes navigable twenty-four miles from its source, near Lechlade, its waters having been greatly augmented by the junction of the Colne, Leach, and Churn; here also is the junction with the Thames and Severn canal. The height of its source above sea-level is 370 feet, and that of the stream at Lechlade 250 feet, the average fall between Lechlade and London Bridge (146 miles) being twenty-one inches per mile. The course is remarkably equable throughout. Above Teddington, nineteen miles from London Bridge, the tidal wave may be said to cease, and thence up to Lechlade navigation is carried on by the aid of locks. A small steamer plies as high as Oxford. While at Lechlade the daily flow of the ordinary summer level is about 100,000,000 gallons, the flow at Teddington is about 380,000,000 gallons. There are seven hours of ebb tide and five hours of flow tide. From the Nore to London Bridge, a distance of forty miles, the tidal wave travels in two hours, and in another two hours it reaches Teddington. The width of the river at Teddington is 250 feet, and at London Bridge the width at high tide is 800 feet, the depth being 30 feet, while at low tide the width is 650 feet and the depth 12 feet. Large barges can ascend the river 150 miles above London Bridge, vessels of 200 tons as high as the bridge, and of 400 tons to the Pool, below which, at Irongate and St. Katherine's wharf, deep-sea steamer navigation commences, while vessels of any tonnage can come as high as Deptford.

THÂNA, or TANNAH, a district in Bombay presidency, India, with an area of 4,243 square miles, lying between 18° 42 and 20° 20′ N. latitude and 72° 45′ and 73° 48 E. longitude.

In 1881 the population of Thána was returned at 908,548 (males 468,236, females 440,312); Hindus numbered 806,805, Mohammedans 42,391, and Christians 39,545. The district has seven towns with populations exceeding 10,000, namely, Bandra (14,987), THANA (see below), Bhiwandi (13,837), Kalyan (12,910), Bassein (10,357), Panvel (10,351), Uran (10,149). Rice is by far the most important product; it is also the chief article of export. Sugar-cane and plantains are cultivated largely, as well as mangoes and cocoanuts. The territory comprised in the district of Thána formed part of the dominions of the peshwá, and was annexed by the British in 1818 on the overthrow of Baji ráo. Since then the operations to put down the Koli robbers, which extended over several years, have been the only cause of serious trouble, and in 1874 and 1877, there were a number of gang robberies, which were suppressed, but not without difficulty.

THÁNA, chief town of the above district and a station on the Great Indian Peninsula railway, lies 20 miles northeast of Bombay city, in 19° 11′ 30″ N. latitude and 73° 1′ 30″ E. longitude, and in 1881 had a population of 14,456 (males 7,856, females 6,600). It is a municipal town and a port, and contains a civil hospital and post-office.

THANE, or THEGN. See ENGLAND and NOBILITY.

THANKSGIVING is a legal holiday in the United States, where it is generally observed as a day upon which to return thanks to God for the blessings of the year. The custom is reputed to be of great antiquity, having been borrowed as some declare from the Mosaic law. This, however, is doubtful, notwithstanding the Hebrews were accustomed to celebrate a plenteous harvest by public festivals and acknowledgments. The custom of celebrating national and local festivals became established at the earliest periods. The escape of Leyden was made the occasion for praise services, and the discovery of the Guy Fawkes plot was observed by thanksgiving services in England up to within a comparatively recent period. Some are inclined to the belief that the custom in the United States was imported into this country from Holland, where the "Harvest-Home" festival is an annual feature. However this may be, the origin of Thanksgiving day in the United States is due to the early settlers of New England. Throughout the colonial days in that section, they were of annual occurrence, and during the Revolutionary War congress repeatedly recommended the setting apart of a day to be devoted exclusively to thanksgiving and prayer. At the close of the war, upon the adoption of the constitution and at other periods in the early history of the nation, national thanksgivings were recommended and celebrated. A noticeable feature in this connection, is the fact that Thursday, the day always selected by the New England governors, has been adopted universally throughout the United States as "Thanksgiving day." From New England the custom gradually extended into the Middle States, the Western States, and finally into the Southern States. Prior to the Civil War the proclamations of Thanksgiving were issued by the governors of the several States. During that period, the national executive appointed days of thanksgiving, as also of fasting and prayer, and the precedent thus established has been adopted by succeeding administrations since the close of hostilities.

Thanksgiving day is now celebrated by union services among the Protestant churches, and since 1888 by reciting prayers for the State and Nation in those of the Roman Catholic faith. In the homes of citizens, without respect to religion, faith or church affiliation, it is made a day of merriment and feasting, at which families long separated are re-united, and ceremonies of a social character prevail.

THAPSACUS. See MESOPOTAMIA.

THAR AND PÁRKAR, or THUR AND PARKER, a district in the east of Sind, Bombay presidency, India, with an area of 12,729 square miles. It lies between 24° 13′ and 26° 15′ N. latitude and between 68° 51′ and 71° 8′ E. longitude, and is bounded on the north by Khaipur state, on the east by the states of Jaisalmir, Malani, and Jodhpur, on the west by Hyderabad district, and on the south by the Runn of Cutch. The district is divided into two portions. The western part, called the "Pat," is watered by the Eastern Nara and the Mithrau canals, which constitute the whole water-system of the district, and the presence of water has created a quantity of jungle and marsh; the other part, called the "Thar," is a desert tract of rolling sand-hills, running northeast and southwest, composed of a fine but slightly coherent sand.

The census of 1881 returned the population at 203,344 (males 112,400, females 90,944); Hindus numbered 43,755, Mohammedans 109,924, and Christians only 14. Umarkot, the birthplace of Akbar, is the chief town, with a population of 2,828. The chief products of the district are rice, joár, bajri, cotton, and oil seeds. It is estimated that only 45 per cent. of the arable area is under cultivation. The exports are chiefly rice, wheat, oil seeds, cattle, goats, and sheep; the imports consist of cotton, metals, dried fruits, piece goods, sugar, and tobacco. The manufactures are chiefly blankets, camel saddles, and coarse cotton cloth.

THARRAWADDY, a district in the Pegu division of Burmah, with an area of 2,014 square miles. It lies between 17° 30′ and 18° 40′ N. latitude and between 95° 20′ and 96° 10′ E. longitude, and is bounded on the north by Prome, on the east by the Pegu Yoma range, on the south by Hanthawaddy, and on the west by Henzada.

In 1881 the population was returned at 278,155 (males 143,413, females 134,742), of whom 1,985 were Hindus, 1,110 were Mohammedans, 270,552 were Buddhists, while Christians and aborigines numbered 2,363 and 2,135 respectively. The chief products of the district are rice, sesame, tobacco, sugar-cane, cotton, and fruits.

THASOS, an island in the north of the Ægean Sea, off the coast of Thrace, three and one-quarter miles distant from the plain of the river Nestus (now the Kara-Su). The island was colonized at an early date by Phœnicians, attracted probably by its gold mines; they founded a temple of Hercules, which still existed in the time of Herodotus. Thasus, son of Phœnix, is said to have been the leader of the Phœnicians, and to have given his name to the island. In 720 or 708 B.C. Thasos received a Greek colony from Paros. After the capture of Miletus (494 B.C.) Histiæus laid siege to Thasos. The attack failed, but, warned by the danger, the Thasians employed their revenues to build war ships and strengthen their fortifications. This excited the suspicions of the Persians, and Darius compelled them to surrender their ships and pull down their walls. After the defeat of Xerxes the Thasians joined the Greek confederacy; but afterward (in 467, 465, or 464, according to different calculations), on account of a difference about the mines and marts on the mainland, they revolted. The Athenians defeated them by sea, and, after a siege that lasted more than two years, took the capital, Thasos, and compelled the Thasians to destroy their walls, surrender their ships, pay an indemnity and an annual contribution, and resign their possessions on the mainland. In 411 B.C., at the time of the oligarchical revolution at Athens, Thasos again revolted from Athens and received a Lacedæmonian governor; but in 407 the partisans of Lacedæmon were expelled, and the Athenians under Thrasybulus were admitted. After the battle of Ægospotami (405 B.C.), Thasos again fell into the hands of the Lacedæmonians; but the Athenians must have recovered it, for it formed one of the subjects of dispute between them and Philip of Macedonia. In the embroilment between Philip III. of Macedonia and the Romans Thasos submitted to Philip, but received its freedom at the hands of the Romans after the battle of Cynoscephalæ (197 B.C.), and it was still a "free" state in the time of Pliny. Thasos, the capital, stood on the north side of the island, and had two harbors, one of which was closed. At present (1890) the population of the island, numbering about 17,000, is disposed of in ten small villages along the coast.

THAYETMYO, a district in the Irrawaddy division of Burmah, having an area of 2,397 square miles, and lying between 18° 50′ and 19° 30′ N. latitude and between 94° 30′ and 95° 50′ E. longitude. It is bounded on the north by the newly acquired territory of Burmah, on the east by Toungú district, on the south by Prome, and on the west by Sandoway.

In 1881 the number of inhabitants in the district was 169,560 (males 87,308, females 82,252); Hindus numbered 2,620, Mohammedans 1,861, Christians 2,349, and Buddhists 148,629. The chief town is Thayetmyo, with a population (1881) of 16,097; it is situated in 19° 18′ 43″ N. latitude and 95° 15′ 40″ E. longitude, on the right bank of the Irrawaddy. The chief products are rice, cotton, oil seeds, and tobacco; cutch is also very abundant, and the manufacture of the dye-stuff is carried on extensively. Coal has been found in the district, and earth oil-wells exist, but neither coal nor oil has yet been extracted in any quantity. On the annexation of Pegu by the British in 1852–53, Thayetmyo was formed into a subdivision of Prome district; and in 1870 it was erected into a separate jurisdiction and placed under a deputy-commissioner.

THEATER (*θέατρον*, "a place for seeing," from *θεάομαι*). The invention of a building specially devised for dramatic representations was due to the Athenians (see DRAMA). At first representations at the Dionysiac festivals were held on temporary wooden platforms; an accident, however, which occurred in 500 B.C., induced the Athenians to begin the construction of a permanent building. This first theater was not completed till 340 B.C., and during the interval a large number of theaters, designed on the same model, had been erected in many towns of Greece and Asia Minor, though in some cases, as at Sparta, they were used for assemblies of the people and dances rather than for dramatic performances. The great Dionysiac theater at Athens was placed in the Lenæum, an inclosure sacred to Dionysus, and its auditorium is scooped out of the rock at the base of the Acropolis on its south-east side. A similar position on the slope of a hill was always chosen by the Greeks, and it was not till the first century B.C. that theaters were built by the Romans on a level site.

A description of the existing theater at Myra, in the south-east of Lycia, which, though late in date, is built after the old Greek model, is as follows: The seats for the audience are arranged in concentric tiers, rising like steps one above the other; these mainly rest on a cavity excavated in the hill-side, and the whole space occupied by the spectators was called the *κοῖλον* (Lat. *cavea*). About half way up the slope is an encircling passage (*διάζωμα*, *præcinctio*). Flights of steps divide the seats into wedge-shaped blocks (*κερκίδες*, *cunei*). At the highest level behind the top row of seats ran a colonnade, forming a covered passage with a gallery at the top. Rows of niches were formed in the back wall of this, and also sometimes in the low wall encircling the *διάζωμα*;; in these niches a series of large bronze jars (*ἠχεῖα*) were set; they were intended to catch and repeat the reverberation of the voices from the stage. Vitruvius (iii. 5) gives elaborate directions for the construction of these vases, which were to be tuned in a chromatic scale; he mentions their use by the Greeks, but says he knows of no Roman theater which possessed these vases, the real utility of which is very problematical. The segmental floor space in a Greek theater was called the *ὀρχήστρα* (*orchestra*), and was occupied by the chorus; in the center of this was the *θυμέλη*, a platform slightly raised on steps, in the middle of which was an altar to Dionysus. The stage (*προσκήνιον*, *proscenium*) was a narrow platform, raised three to five feet above the orchestra, with which it communicated by stairs, so that the chorus could move around from one place to the other; the central part of the stage, where the principal actors usually stood, was the *λογεῖον* (*pulpitum*). The stage was also connected with a chamber under it (*ὑποσπήνιον*) by a flight of stairs called *χαρώνιοι κλίμακες*, by which ghosts ascended. At the back of the stage was a lofty wall, which usually reached to the level of the colonnade behind the highest row of seats; this was the *σκηνή* (*scena*), in which were three doors leading into the stage from the actors' dressing-rooms behind it. This wall was usually decorated with three orders of columns and entablatures, forming an architectural façade, which represented a palace or temple, before which the action of the play was supposed to take place. Other movable wooden scenery was in some cases added in front of the permanent scena; or curtains with woven or embroidered figures were hung against it to form a background to the actors (*παραπέτασμα* or *αὐλαίαι*, *aulæa* or *siparium*). More elaborate painted scenes were also used, but, according to Aristotle (*Poet.*, iv. 16), not before the time of Sophocles. Various kinds of machinery were used, such as the *μηχανή*, to suspend in the air an actor who was playing the part of a god descending from heaven; and the *βροντεῖον*, an apparatus to imitate thunder by stones rolled in metal jars, probably in the ghost-chamber under the stage. Women were not excluded from the Greek tragic drama, but appear to have sat by themselves in the upper rows of seats (Athenæus, xii. 534). At least in late times the chief priestesses of Athens occupied marble thrones in the *προεδρία* or front row.

Outside Athens the largest Greek theaters were those at Megalopolis (Paus., viii. 32), Cnidus, Syracuse, Argos, and Epidaurus. By the end of the fourth century B.C. every important Hellenic city possessed its theater, and new ones were built or old ones restored throughout the whole period of Roman domination.

The Roman Theater.—In the main the theaters of the Romans were copied closely from those of the Greeks, but in the Greek theater the orchestra occupied more than a semicircle, while the Romans made it exactly half a circle. The Romans also introduced another important change, in many cases constructing theaters on a level site, not scooped out of a hillside as in the case of Hellenic theaters. This necessitated an elaborate arrangement of substructures, with raking vaults to carry the seats of the cavea, and also an additional visible façade with tiers of arches following the semicircle of the auditorium. The design universally adopted for this appears to have been tiers, usually three in number, of open arches, with intermediate engaged columns, each tier being of a different order, as is still to be seen in the remains of the theater of Marcellus in Rome. The development of the use of the stone arch, and still more the use of concrete for forming vaults, enabled the Romans to erect their theaters on any site. Those in Rome were placed in the level plain of the Campus Martius.

In some cases the Romans built two theaters close together, one for the Greek and the other for the Latin drama, as is the case at Hadrian's magnificent villa near Tivoli. The two theaters at Pompeii are still well preserved, and all Roman provincial towns of any importance seem to have possessed at least one theater, designed with the semicircular orchestra after the Roman fashion. The theaters built under the Roman rule in Hellenic cities seem, on the other hand, to have been usually constructed on the old Greek model, probably because they were designed by Greek architects. In the Roman theater the "orchestra" was occupied, not by the chorus, but by senators and other persons of rank (Vitr., iii. 6). The Romans used scenery and stage effects of more elaboration than was the custom in Greece. Vitruvius (iii. 7) mentions three sorts of movable scenery: (1) for the tragic drama, façades with columns representing public buildings; (2) for comic plays, private houses with practicable windows and balconies; and (3) for the satyric drama, rustic scenes, with mountains, caverns, and trees.

The Modern Theater.—During the Middle Ages miracle plays with sacred scenes were the favorite kind of drama; no special buildings were erected for these, as they were represented either in churches or in temporary booths. In the sixteenth century the revival of the secular drama, which, in the reign of Elizabeth, formed so important a part of the literature of England, was carried on in tents, wooden sheds, or courtyards of inns, mostly by strolling actors of a very low class. It was not till toward the close of the century that a permanent building was constructed and licensed for dramatic representations, under the management of Shakespeare and Burbage. In the sixteenth and seventeenth centuries a favorite kind of theatrical representation was in the form of "masques," with processions of grotesquely attired actors and temporary scenic effects of great splendor and mechanical ingenuity. In the reigns of James I. and Charles I., Ben Jonson and the architect Inigo Jones worked together in the production of these "masques," Jonson writing the words and Inigo Jones devising the scenic effects, the latter being very costly and complicated, with gorgeous buildings, landscapes, and clouds or mountains, which opened to display mimic deities, thrown into relief by colored lights. These masques were a form of opera, in which Ben Jonson's words were set to music.

In Italy, during the sixteenth century, the drama occupied a more important position, and several theaters were erected, professedly on the model of the classic theater of Vitruvius.

In France the miracle play developed into the secular drama rather earlier than in England. In the reign of Louis XI., about 1467, the "Brothers of the Passion" had a theater which was partly religious and partly satirical. In the sixteenth century Catherine de' Medici is said to have spent incredible sums on the dresses and scenery for the representation of the Italian ballet; and in the middle of the seventeenth century the regular opera was introduced at Paris.

At the end of the eighteenth century the theaters of San Carlo at Naples, La Scala at Milan, and La Fenice at Venice were the finest in Europe; all these have been rebuilt in the present century, but have been eclipsed by the theaters of Paris, St. Petersburg, and other capitals, both in size and architectural splendor.

In the modern theater the auditorium has changed comparatively little, except that the seats have gradually encroached upon and almost absorbed the pit. The arrangement of the boxes, seats, balcony, and gallery are too well known to need description. Few people have, however, any notion of the immense size and extreme complication of the space and machinery behind the proscenium, of which the visible stage occupies but a very small proportion. The stage-floor slopes upward away from the audience, so that it may appear deeper than it really is by diminishing the foreshortening. Its extent behind the most distant plane of scenery is usually quite as great as that which the audience sees. In addition to this extension of the visible stage, there are three other enormous spaces filled with the machinery to work the scenery.

(1) Of these the first consists of the "wings" (Fr. *coulisses*), a series of chambers or platforms on each side of the stage, arranged many stories high, and reaching to more than double the height of the proscenium.

(2) The "dock" or under-space (Fr. *dessous*), extending under the whole area of the stage floor, and about equal in height to the proscenium, is divided into three or four stories by successive floors, and contains long rows of immense windlasses (Fr. *gril*) for raising and lowering scenery, and also an elaborate arrangement of lifts by which actors can suddenly appear or vanish through the stage floor. A very ingenious device called the "star trap" allows an actor to vanish through the floor without any opening in it being visible. This is done by making the trap door of thin boards (something like a Venetian blind) fixed on to flexible bands of steel; the weight of the actor makes these open in the middle and let him through, while the steel springs close the opening as soon as they are released. The whole movement is so rapid that the actor seems to sink through the solid floor.

(3) The third space, and the largest of all, is that above the proscenium—the "flies" (Fr. *dessus* or *cintre*), extending over the whole of the stage, and reaching sometimes to nearly double the height of the proscenium. This also is divided into many floors, and contains rows of great windlasses, by which scenery can be hoisted up out of sight, without folding or bending it. All these three parts of the building are filled with a complicated but most orderly series of ropes, lifts, and machinery of every sort, of which it is impossible here to give a detailed description.

The old method of fixing scenery was to slide it in two halves from the wings in grooves formed in the stage floor: these are no longer used, as much more realistic effects can be gained by supporting scenery from the top, or by building it up with supports of its own, so that, instead of a series of painted planes set parallel to the stage front, castles, cathedrals, or even whole streets are actually built upon the stage, and give striking effects of real perspective.

A rapidly growing tendency now exists to increase the mechanical perfection of the theater. The extended use of iron instead of wood for the stage floor and the various machines has been a great gain in space and rapidity of working. It is now considered a great object to drop the curtain as seldom as possible, and even the Grand Opera House of Paris is now left far behind in the modern competition for mechanical perfection, though from an architectural point of view it is the most magnificent and costly of all existing buildings of its kind.

The latest improvement to prevent delay between the scenes has been introduced in the Madison Square theater in New York city, which has two stages, one above the other. During the performance of a scene the second stage floor is being prepared in the under-space, with all its scenery fixed, and when the curtain falls the first stage rises into the upper regions and the second floor goes up to take its place. These floors are accurately balanced by heavy counterpoise weights, so that the whole of these enormous masses are moved with comparatively little force.

In addition to the above mentioned parts of the theater, which are reserved for the mechanical working of the performance, much space is occupied by the "green-room" for the actors, and rows of dressing-rooms. An immense deal of storage room is also required, and some of the Parisian theaters have large magazines for this purpose in the suburbs. In many cases also the atelier for the scene painters is far removed from the theater, and thus far better space and lighting for the work can be provided.

The painting of theatrical scenery has frequently been the work of artists of very high talent, such as Raphael in Rome, Watteau, Boucher, and Servandoni in France, and Stanfield in England. Paintings of very high artistic merit and wonderfully decorative effect are now produced for theatrical purposes, especially in France, Germany, and England. In England especially great historical and antiquarian knowledge are brought to the aid of this branch of the art. The landscapes in particular are sometimes works of great beauty, and very beautiful effects of lake scenery with trees and mountains reflected in the water are got by setting great sheets of plate glass over the stage floor, slightly inclined, so that a real reflection is thrown by the landscape painted on the scene behind. Another ingenious device, used by Wagner at Baireuth, and also in England for magical scenes, was to form a thin and semi-transparent curtain of vapor, which was sent up by a perforated steam-pipe concealed in a groove in the stage.

The various methods of lighting used are an important item in the production of striking effects. Dip candles were used till 1720, when molded candles were introduced into French theaters. The next improvement was the lamp of M. Argand, with its circular wick. In 1822 gas was first used in a Parisian theater, next came the oxyhydrogen lime light, used for special effects, and now electric lighting is rapidly superseding all other kinds.

The old way of producing lightning was to blow lycopodium or powdered resin with bellows through a flame, and this is still used in realistic effects of conflagrations. More effective lightning is now made by flashing the electric light behind a scene painted with clouds, in which a zigzag aperature has been cut out and filled with a transparent substance. Thunder is made by shaking large sheets of iron, by rolling cannon balls above the ceiling of the auditorium, and by clapping together a series of planks strung together on two ropes. Wind is imitated by a machine with a cogged cylinder, which revolves against coarse cloth tightly stretched. The sound of rain is produced by shaking parched peas in a metal cylinder.

The orchestra is now usually arranged either below or above the proscenium. The prompter is placed at one side, in the wings, so as to avoid the disfigurement of the hood-like box which formerly used to cut the front line of the stage into two halves. This is, however, less convenient for the actors.

Till the middle of the present century little trouble or expense was laid out on dresses and accessories. Certain conventional costumes, made of cheap stuff, were used for each part, with but little regard to historical correctness. Armor and weapons were made of pasteboard covered with metal foil, and stage jewelry was made of small cup-like pieces of tin formed with many facets. Now, however, no trouble or expense is spared to get the costumes and various properties archæologically correct: real jewels and the richest stuffs are often used for the dresses, as well as real furniture of the most costly sort for the furnishing of the scenic rooms. All this splendor and realism is very hostile to the true interest of the drama; magnificent scenery and costly accessories are expected by the audience, rather than good acting. In some scenes, such as the ball in the first act of Romeo and Juliet, as recently represented, the words and acting of the chief performers were almost lost in the general bustle and splendor of the scene. Frequently, too, the noise of setting up some elaborate scene behind almost drowns the voices of the actors in front of the drop scene.

In the United States, public entertainments, dramatic or otherwise, are usually under the control of the municipal authorities. In some States, such as New York and Massachusetts, there is State legislation, requiring places of public entertainment to be licensed by the proper authority. In many States it is a condition of the license that intoxicating liquors shall not be sold in such places. Other conditions, more or less usual, are that there shall be no Sunday or dangerous performances, that acrobats shall be properly protected, and that female waiters shall not be employed. Structural qualifications are in some cases made necessary. Thus in 1885 the New York legislature passed an Act containing many minute provisions for insuring the safety of theaters against fire. A characteristic piece of legislation is the New York Act of 1873, c. 186, enacting that no citizen is to be excluded from a theater by reason of race, color, or previous condition of servitude.

THEBES. See EGYPT,

THEBES (anciently *Θῆβαι*, *Thebæ*, or in poetry sometimes *Θῆβα*, in modern Greek *Phiva*, or, according to the corrected pronunciation, *Thivæ*), one of the most interesting towns in Greece, is situated on low hilly ground of gentle slope a little north of the range of Cithæron, which divides Bœotia from Attica, and on the edge of the Bœotian plain, about forty-four miles from Athens, whence it is now reached by two carriage-roads. It has about 3,500 inhabitants, and is the seat of a bishop. The present town occupies the site of the ancient citadel, the Cadmea.

In prehistoric times the Cadmea, with the enlarged city of Thebes, into which it developed, was a power of the first rank, as is shown by its unrivaled legends.

The history of the town to the end of the fourth century is part of the general history of the nation (see GREECE). It had an aristocratic constitution, and claimed a contested sovereignty over the other towns of Bœotia. Down to 371 B.C. this status was not essentially changed. The battle of Coronea (394) showed the increasing military strength of the Thebans, and in 371 the genius of Epaminondas raised them by the victory of Leuctra for a brief period to the leading position in Hellas. Philip of Macedon spent part of his youth as a hostage at Thebes, and probably learnt there important lessons in war. By him and his successor the state was destroyed. In 338 the Thebans shared with the Athenians the defeat of Chæronea, and received a Macedonian garrison. In 335, after the death of Philip, they revolted, and were punished by Alexander with a fearful vengeance. It is said that 6,000 Thebans were slain at the capture and 30,000 taken prisoners. The population was dispersed, and the town entirely razed (except, according to tradition, the house of the poet Pindar); and, though it was soon restored by the Macedonian Cassander (315), it never again played a leading part in history. In 86 B.C., having sided against the Romans in the Mithradatic war, it was plundered by Sulla, and fell into such decay that Strabo describes it as little better than a village. In the second century the traveler Pausanias, who gives a full account of it, found only the citadel inhabited. In 395 A.D., however, it had some strength, for Alaric, on his way to the capture of Athens, did not think fit to attack it. In the later times of the Eastern empire (tenth to twelfth century), it again became wealthy and important, being specially celebrated for the manufacture of silk and cloth. In 114[illegible] it was plundered by the Normans of Sicily (who transferred thither the chief artisans of the silk trade), and, after the capture of Constantinople by the crusaders (1204), it became with Athens a fief of the feudal empire. In 1311 it was again plundered by the Catalan Grand Company, a body of Spanish mercenaries, and appears to have had no return of prosperity.

THECLA, ST., is commemorated by the Latin Church on September 23d. The *Breviary* relates that she was born of illustrious parentage at Iconium, and came under the personal teaching of the apostle Paul. In her eighteenth year, having broken her engagement with Thamyris, to whom she had been betrothed, she was accused by her relations of being a Christian, and sentenced to be burned. Armed with the sign of the cross, she threw herself upon the pyre, but, the flames having been extinguished by a sudden rain, she came to Antioch, where she was exposed to the wild beasts, then fastened to bulls that she might be torn asunder, then thrown into a pit full of serpents, but from all these perils she was delivered by the grace of Christ. Her ardent faith and her holy life were the means of converting many. Returning once more to her native place, she withdrew into a mountain solitude, and became distinguished by many virtues and miracles, dying at the age of ninety. She was buried at Seleucia.

THE DALLES. The capital of Wasco county, Ore., is eligibly situated on the Columbia river, ninety miles east of Portland, and is a flourishing city of considerable prominence. It is also located on the Oregon Railway and Navigation Company's road, and communicates with Portland by steamer. The channel of the river at this point contracts to a width of less than 200 feet, the rapids obstructing navigation, but a railroad has been built to Celilo, 14 miles distant, which connects with the navigable portions of the river, thence to its mouth, 200 miles distant. The city contains a courthouse, one private and two national banks, six churches, two weekly papers, public schools, a Catholic academy and a large number of stores. The Dalles is also the location of a branch of the United States mint. The manufacture of lumber and lumber products is extensively engaged in, besides which there are flour and woolen mills, a trunk factory and some other lines of industrial endeavor. The population, 2,232 in 1880, has increased to 5,000 in 1890.

THEFT is, in modern legal systems, universally treated as a crime, but the conception of theft as a crime is not one belonging to the earliest stage of law. To its latest period Roman law regarded theft (*furtum*) as a delict *prima facie* pursued by a civil remedy—the *actio furti* for a penalty, the *vindicatio* or *condictio* for the stolen property itself or its value. In later times, no doubt, a criminal remedy to meet the graver crimes gradually grew up by the side of the civil, and in the time of Justinian the criminal remedy, where it existed, took precedence of the civil (*Cod.*, iii. 8, 4). But to the last criminal proceedings could only be taken in serious cases, *e.g.*, against stealers of cattle (*abigei*) or the clothes of bathers (*balnearii*). The punishment was death, banishment, or labor in the mines or on public works. In the main the Roman law of theft coincides with the English law.

In England theft appears to have been very early regarded by legislators as a matter calling for special attention. The pre-Conquest compilations of laws are full of provisions on the subject. It is noticeable that the earlier ones appear to regard theft as a delict which may be compounded for by payment. Considerable distinctions of person are made, both in regard to the owner and the thief. Thus, by the laws of Ethelbert, if a freeman stole from the king he was to restore ninefold, if from a freeman or from a dwelling threefold. If a theow stole, he had only to make a twofold reparation. In the laws of Alfred ordinary theft was still only civil, but he who stole in a church was punished by the loss of his hand. The laws of Ina named as the penalty death or redemption according to the wer-gild of the thief. By the same laws the thief might be slain if he fled or resisted. Gradually the severity of the punishment increased. By the laws of Athelstan death in a very cruel form was inflicted. At a later date the *Leges Henrici Primi* placed a thief in the king's mercy, and his lands were forfeited. Putting out the eyes and other kinds of mutilation were sometimes the punishment. The principle of severity continued down to the present century, and until 1827 theft of certain kinds remained capital.

The term theft in modern English law is sometimes used as a synonym of larceny, sometimes in a more comprehensive sense. In the latter sense it is used by Mr. Justice Stephen, who defines it as "the act of dealing from any motive whatever, unlawfully and without claim of right, with anything capable of being stolen, in any of the ways in which theft can be committed," "with the intention of permanently converting that thing to the use of any person other than the general or special owner thereof." In this broader sense the term applies to all cases of depriving another of his property, whether by removing or withholding it. It thus includes larceny, robbery, cheating, embezzlement, and breach of trust. Embezzlement is a statutory crime created as a separate form of offense in the last century. The difference between larceny and embezzlement turns mainly on the fact of the master's being in actual or constructive possession of the stolen property (see POSSESSION). Fraudulent breach of trust was not made a specific offense until 1857 (see TRUST).

Larceny (a corruption of *latrocinium*), or theft proper, was felony at common-law. The common law of larceny has been affected by numerous statutes, the main object of legislation being to bring within the law of larceny offenses which were not larcenies at common law, either because they were thefts of things of which there could be no larceny at common law, or because the common law regarded them merely as delicts for which the remedy was by civil action.

Robbery is larceny accompanied by violence or threatened violence. Whether obtaining money by threats to accuse of crime was robbery at common law was open to some doubt. It is now a specific offense under the Larceny Act, punishable by penal servitude for life.

Cheating is either a common-law or a statutory offense. An indictment for cheating at common law is now of comparatively rare occurrence. The statutory crime of obtaining money by false pretenses is the form in which the offense generally presents itself. Like embezzlement, this offense dates as a statutory crime from the last century.

Stolen Goods.—The owner of the goods stolen has an action against the thief for the goods or their value. How far he is entitled to pursue his civil right to the exclusion of criminal prosecution does not seem very clear upon the authorities. Dealing with stolen goods by persons other than the thief may affect the rights of such persons, either criminally or civilly. Two varieties of crime arise from such dealings: (1) Receiving stolen goods, knowing them to have been stolen, a misdemeanor at common law, is, by the Larceny Act, a felony, punishable by penal servitude for fourteen years where the theft amounts to felony; a misdemeanor, punishable by penal servitude for seven years where the theft is a misdemeanor, as in obtaining goods by false pretenses. Recent possession of stolen property may, according to circumstances, support the presumption that the prisoner is a thief or that he is a receiver.

(2) Compounding theft, or theftbote, that is, taking back stolen goods or receiving compensation on condition of not prosecuting, is a misdemeanor at common law. It need not necessarily be committed by the owner of the goods. Under the Larceny Act it is a felony punishable by seven years' penal servitude to corruptly take money or reward for helping to recover stolen goods without using all due diligence to bring the offender to trial. By the same Act, to advertise or print or publish any advertisement offering a reward for the return of stolen goods, and using any words purporting that no questions will be asked, etc., renders the offender liable to a penalty of $250. Various Acts provide for the liabilities of pawnbrokers, publicans, marine-store dealers, and others into whose possession stolen goods come. Search for stolen goods can only be undertaken by a police officer under the protection of a search warrant. The law as to stolen goods, as far as it affects the civil rights and liabilities of the owner and third parties, is shortly as follows: As a general rule a purchaser takes goods subject to any infirmities of title. The property in money, bank-notes and negotiable instruments passes by delivery, and a person taking any of these *bona fide* and for value is entitled to retain it as against a former owner from whom it may have been stolen. In the case of other goods, a *bona fide* purchaser of stolen goods in market overt (see SALE) obtains a good title (except as against the crown), provided that the thief has not been convicted. After conviction of the thief the property revests in the owner, and the court before which the thief was convicted may order restitution, except in the cases especially mentioned in the Larceny Act, *i. e.*, the *bona fide* discharge or transfer of a security for value without notice and the fraudulent dealing by a trustee, banker, etc., with goods and documents of title to goods intrusted to him. After conviction of the thief the goods must be recovered from the person in whose hands they are at the time of the conviction, for any sales and resales, if the first sale was in market overt, are good until conviction of the thief. If the goods were obtained by false pretenses and not by larceny, the question then is whether the property in the goods has passed or not, and the answer to this question depends upon the nature of the false pretenses employed. If the vendee obtains possession of goods with the intention by the vendor to transfer both the property and the possession, the property vests in the vendee until the vendor has done some act to disaffirm the transaction. But if there was never any such intention—if, for instance, the vendor delivers the goods to A. B. under the belief that he is C. D.—the property does not vest in the transferee, and the owner may recover the goods even from a *bona fide* purchaser.

United States.—The law depends almost entirely upon State legislation, and is in general accordance with that of England. The only Acts of Congress bearing on the subject deal with theft in the army and navy, and with theft and receiving on the high seas or in any place under the exclusive jurisdiction of the United States. The doctrine of market overt is not acknowledged by any State.

THEISM. The term theism has three significations. In its widest acceptation its object is the Divine, whether regarded as personal or impersonal, as one being or as a number of beings. In this sense theism is coextensive with religion and worship, includes all forms of polytheism and of pantheism, as well as all varieties of monotheism, and so may be said to denote the genus of which polytheism, pantheism, and monotheism are species. The complete negation of theism in its generic sense is atheism—the denial of the existence or of the knowability of the Divine. It is only in modern times that the word atheism has acquired this meaning, only in recent times that it has come to be exclusively employed with this meaning. The Greeks meant by it simply disbelief in the Greek gods. The early Christians were called atheists because they refused to acknowledge the pagan deities. Protestants have been charged by Roman Catholics and Roman Catholics by Protestants with atheism. Atheism, in the sense now generally admitted to be alone appropriate, may be of three species—namely, denial of the existence of the Divine, denial that the Divine has been shown to exist, and denial that it can be known that the Divine exists. The first species has been called *dogmatic atheism*, the second *critical atheism;* and the third has deen designated, and may conveniently be designated, *religious agnosticism.* Agnosticism *per se* should not be identified with atheism or with any of its forms.

It is somewhat remarkable that the term theism by itself never occurs in its etymological and generic sense, never means as a separate word what it means in the compounds atheism, polytheism, pantheism, and monotheism. Ordinarily it is identified with monotheism, and consequently opposed to polytheism, and to pantheism, as well as to atheism.

Sometimes the term theism is employed in a still more special sense, namely, to denote one of two kinds of monotheism, the other kind being *deism.* Although *deus* and *theos* are equivalent, deism has come to be distinguished from theism. The former word first appeared in the sixteenth century, when it was used to designate antitrinitarian opinions. Kant, in his *Kritik der reinen Vernunft*, explicitly distinguished and opposed deism and theism, but in a very peculiar manner. "The person who believes in a transcendental theology alone is termed a *deist;* he who acknowledges the possibility of a natural theology also, a *theist.*" In recent theology deism has generally come to be regarded as, in common with theism, holding in opposition to atheism that there is a God, and in opposition to pantheism that God is distinct from the world, but as different from theism in maintaining that God is separate from the world, having endowed it with self-sustaining and self-acting powers, and then abandoned it to itself. This distinction is real, and perhaps the best attainable.

The present article will treat specially of theism in the sense of monotheism, but not to the exclusion of the relations between theism thus understood and theism in other acceptations.

Monotheism has been very generally assumed to have been the primitive religion. Lord Herbert, Cudworth, and others have elaborately defended this opinion in the past, and it still finds learned advocates. On the other hand, the vast majority of recent anthropologists hold that religion originated in some rude phase of polytheism, and that monotheism has been everywhere preceded by polytheism. Schelling, Max-Müller, and Hartmann have maintained that the starting-point of religion was *henotheism*, an imperfect kind of monotheism, in which God was thought of as one, only because others had not yet presented themselves to the mind—a monotheism of which polytheism was not the contradiction, but the natural development. Pantheism has also been frequently represented to be the earliest phase of religion. All these representations, however, will be found on examination to be very conjectural. The present state of our knowledge does not warrant our holding any view regarding the nature of primeval religion as established. The data which carry us farthest in our search for the historical origin of religion are undoubtedly the names expressive of the Divine which have been preserved in the most ancient languages. They show us how men conceived of the Divinity long before the erection of the oldest monuments or the inscription of the oldest records. Language is much older than any of the statements in language. But language by no means carries us back to primitive man, or even to the historical origin of the idea of deity. The Egyptian word *nutar* and the names of the Egyptian gods found in the oldest Egyptian inscriptions prove that at a date long before the Egyptians wrote history, or are known to have worshiped animals or ancestors, they conceived of Divinity as power, and their deities as great cosmic forces; but, as that word and these names cannot be shown to have belonged to man's primitive speech, they cannot show what was man's primitive religious belief, and do not disprove that the forefathers of the people who first used them may have had some lower and ruder conception of the Divine than that which they convey. There are, according to Doctor Legge, no words in the Chinese language known to be older than *ti*, *t'ien*, *shang-ti*, and these words are good historical evidence that the Chinese conceived of the Divine, thousands of years before the Christian era, as a universal ruling power, comprehending the visible heavens, and an invisible, infinite, omnipresent force, manifested in the azure of the firmament, possessed so far of intellectual and moral qualities, and working toward ethical ends. There is no evidence that when the Chinese first used these words they worshiped fetiches, but neither is there evidence to the contrary, and even if there were it would not disprove that the ancestors of the Chinese had passed through an era of fetichism. All members of the Semitic family of languages have the word *El*, or some modification of it, to denote deity, and hence we may conclude that the Semites had the word in this sense before they separated and became distinct peoples, but not that the idea of God originated when the word was first thus employed. All members of the Teutonic group of languages have the word *God*, or some slightly modified form thereof, and all members of the Slavic group of languages have the word *Bog*, or some modification thereof, to express the same conception: it does not follow that either Teutons or Slavs had no idea of deity until the former so applied the word *God*, and the latter so applied the word *Bog*. Both Teutons and Slavs are Aryans, and there is an older Aryan term for deity than either *God* or *Bog*. The Sanscrit *deva*, the Latin *deus*, and the northern *ti*, *tivar*, are forms of a word which must have been used by the Aryans to express their idea of the Divine when, in a prehistoric age, they lived together in their original home; but we are not entitled to infer that even that prehistoric Aryan term is the oldest word for deity. It may not be older than the primitive Semitic word or the primitive Turanian word, or the *nutar* of the Egyptians, or the *t'ien* of the Chinese, or the earliest designations for the Divine in the earliest African and American languages. And there may have been Divine names older than any of these. The science of language has been able to reconstruct in part a prehistoric Aryan language, and may similarly be able to construct a prehistoric Semitic language, a prehistoric Turanian, and perhaps a prehistoric Hamitic language. Should it proceed thus far it will probably perceive that all these prehistoric languages arose out of a still earlier prehistoric language in which also were words expressing ideas of the Divine.

The belief in primitive monotheism is generally rested on the authority of the opening chapters of Genesis. It is, however, doubtful if the appeal to them be legitimate, because it is doubtful if their strict historicity can be proved to those who insist on judging them merely by critical and historical criteria, or even if can be fairly inferred from the view that they form part of a revelation. Then, although these chapters plainly teach monotheism, and represent the God whose words and acts are recorded in the Bible as no mere national God but the only true God, they do not teach, what is alone in question, that there was a primitive monotheism—a monotheism revealed and known from the beginning. They give no warrant to the common assumption that God revealed monotheism to Adam, Noah, and others before the flood, and that the traces of monotheistic beliefs and tendencies in heathendom are derivable from the tradition of this primitive and antediluvian monotheism.

It is impossible to prove historically that monotheism was the primitive religion. Were, then, the oldest known historical forms of religion monotheistic? Many maintain they were, but adequate evidence has never been adduced for the opinion. The oldest known religion is probably the Egyptian, and for at least three thousand years its history can be traced by the aid of authentic records contemporary with the facts to which they relate. Its origin, however, is not disclosed by Egyptian history, and was unknown to the Egyptians themselves. When it first appears in the light of history it has already a definite form, a character not rude and simple, but of considerable elevation and subtility, and is complex in contents, having certain great gods, but not so many as in later times, ancestor-worship, but not so developed as in later times, and animal worship, but very little of it as compared with later times. For the opinion that its lower elements were older than the higher there is not a particle of properly historical evidence—not a trace in the inscriptions of mere propitiation of ancestors, or of belief in the absolute divinity of kings or animals; on the contrary, ancestors are always found propitiated through prayer to some of the great gods, kings worshiped as emanations and images of the sun-god, and the divine animals adored as divine symbols and incarnations. The greater gods mentioned on the oldest tombs and in the oldest writings are comparatively few, and their mere names—Osiris, Horus, Thoth, Seb, Nut, Anubis, Apheru, Ra, Isis, Neith, Apis—conclusively prove that they were not ancient kings or deceased ancestors, but chiefly powers of nature, and especially, although not exclusively, of the heavens; yet from the earliest historical time they were regarded as not merely elemental, but as also ethical powers, working indeed visibly and physically in the aspects and agents of nature, yet in conformity to law and with intelligence and moral purpose. Wherever the powers of nature are thus worshiped as gods, the feeling that the separate powers are not all power, that the particular deities are not the whole of divinity, must be entertained and will find expression. The Egyptians had undoubtedly such a sense of the unity of the Divine from the dawn of their history, and they expressed it so strongly in various ways from a very early period that they have been pronounced monotheists not merely by theologians attached to a traditional dogma but by most eminent Egyptologists—De Rougé, Mariette, Brugsch, and Renouf. As these scholars, however, truthfully present the facts, they satisfactorily refute themselves. A religion with about a dozen great gods—distinct as regards their names, characteristics, histories, relationships, symbols, and worship—is not monotheism in the ordinary or proper sense of the term. A religion in which the Divine is viewed as merely immanent in nature, and the deities deemed physical as well as moral, elemental as well as ethical powers, is rather pantheistic than monotheistic. As to the ancient Chinese religion, Doctor Legge easily shows that Professor Tiele's description of it as "a purified and organized worship of spirits, with a predominant fetichist tendency," has no historical warrant, but he fails completely to substantiate his own view, namely, that it was a strict and proper monotheism. The names T'ien and Ti afford no evidence that the early Chinese fathers regarded deity as truly and properly spiritual and personal. It is not in the most ancient Chinese writings that spirituality and personality are ascribed to T'ien, and such ascriptions are exceptional in Chinese writings of any date. The great development of ancestor worship in China has been largely due to the impersonal character of T'ien. The arguments which have been adduced in support of the hypothesis of a primitive Semitic monotheism are also insufficient. M. Renan's belief in a monotheistic instinct peculiar to the Semitic race has been so often and so convincingly shown to be contradicted both by history and psychology that another refutation of it might well be regarded as a mere slaying of the slain. Divine names like El, Baal, Adon, and Melech, being the oldest terms in the Semitic languages expressive of the Divinity, and having been retained through all the changes and perversions of Semitic religion, have often been maintained to imply that primitive Semitic belief was monotheistic. But in reality Baal, Melech, and Adon were not names originally, or indeed at any time, given to the one Supreme God, or exclusively to any particular god; on the contrary, they were titles applicable to many different gods. The oldest historical form of Aryan religion—the form in which the Vedas present it—is designated by Max Müller henotheism, in opposition to the organized anthropomorphic polytheism to which he restricts the term polytheism, but henotheism thus understood includes polytheism in its wider and more ordinary acceptation, while it excludes monotheism properly so called. The oldest known form of Ayran religion was indubitably polytheistic in the sense of being the worship of various nature-deities; and everything approximating to monotheism in India, Persia, Greece, and other Aryan-peopled lands was the product of later and more advanced thought. The assertion that history everywhere or even anywhere shows religious belief to have commenced with monotheism is not only unsupported by evidence but contrary to evidence.

While the oldest known religions of the world were thus not forms of monotheism, neither were they mere polytheisms, wholly devoid of monistic and monotheistic germs and tendencies. The Chinese religion, indeed, can hardly be said to have been at any period a polytheism, the Chinese people no more regarding spirits and deceased ancestors as gods than Roman Catholics so regard angels and saints. They have throughout their whole known history explicitly and clearly acknowledged the unity of the Divine—the uniqueness of T'ien (Ti, Shang-Ti). Had they in like manner acknowledged the spirituality, personality, transcendence of the Divine, their monotheism would have been indubitable. Then, even in those ancient religions, where a plurality of deities is apparent, a sense of the unity of the Divine is notwithstanding implied, and in the course of their development comes to expression in various ways. It could not be otherwise, for in these religions the divine powers (deities) are also powers of nature, and hence sprung from and participant in a mysterious common nature, an ultimate and universal agency which is at once the source of physical and divine existences and forces. Neither nature-deities nor powers of nature are ever conceived of, or indeed can be conceived of, as entirely distinct and independent. The lowest forms of polytheism, such as fetichism and animism, have no more marked characteristic than the indefiniteness of their idea of the Divine and the imperfect individualization of their deities. In the highest forms of nature-worship, *e.g.*, the Vedic, Egyptian, and Babylonian-Assyrian, the same trait is perceptible. This implicit monism of nature-worship may, through the action of various causes, come to explicit utterance in diverse modes, and has in fact done so, with the result that even in the oldest known polytheisms are to be found remarkable approximations to monotheism.

A monotheistic movement can be clearly traced in ancient Greece. The popular religion of Greece, as it appeared in the Homeric poems, was as distinctly polytheistic and as little monotheistic as any known religion. Its gods were all finite, begotten, and thoroughly individualized beings. The need of unity was responded to only by the supremacy of Zeus, and Zeus was subject to destiny, surrounded by an aristocracy far from orderly or obedient, and participant in weakness, folly, and vice. To its eternal honor the Greek spirit, however, was not content with so inadequate a conception of the Divine, but labored to amend, enlarge, and elevate it. The poets and dramatists of Greece purified and ennobled the popular myths, and, in particular, so idealized the character and agency of Zeus as to render them accordant with a true conception of the Godhead. They developed the germs of monotheism in the Greek religion, while leaving untouched its polytheistic assumptions and affirmations. These, however, were not only persistently undermined, but often directly attacked by the philosophers, some of whom eventually reached a reasoned knowledge of the one absolute Mind.

Israel presents us with the first example of a monotheistic nation. The controversies as to how Israel acquired this preëminence can only be decided by critical and historical investigations into which we cannot here enter.

The science of Old Testament theology, giving due heed to the results of critical, historical, and exegetical research regarding the documents with which it deals, has to trace by what means and through what stages Hebrew monotheism was developed and established; and to the treatises on this science our readers must be referred. The monotheistic movement in Israel was one of continuous progress through incessant conflict until a result was reached of incalculable value to humanity. That result was a faith in God singularly comprehensive, sublime, and practical—a faith which rested, not on speculation and reasoning, but on a conviction of God having directly revealed Himself to the spirits of men, and which, while ignoring metaphysical theorizing, ascribed to God all metaphysical as well as moral perfections.

The God of the Old Testament is also the God of the New. Christ and the apostles accepted what Moses and the prophets had taught concerning God; they assigned to Him no other attributes than had already been assigned to Him. Like Moses and the prophets also they made no attempt formally to prove the existence or logically to define the nature of God, but spoke of Him either as from vision or inspiration. And yet their doctrine of God has original and peculiar features. Thus, first, the fatherhood of God was taught with incomparable distinctness and fullness by Jesus Christ—a fatherhood not merely of natural creation or national election, but of spiritual relationship; of love, sympathy, mercy, and grace for individual souls. Such fatherhood, if acknowledged at all, was only very rarely and vaguely acknowledged in heathendom, and, although not wholly absent from the Old Testament, is far from being clearly and prominently there, and, indeed, is present chiefly by implication in passages which refer directly only to God's connection with the people of Israel, as an elect and covenant people; it is conspicuous and central, however, in the conception of God introduced by Christianity. Secondly, Divine fatherhood had its correlate in Divine sonship. God is represented in the New Testament as revealing His fatherhood through His Son, Jesus Christ. In Old Testament representations of Israel, the Messiah, and Wisdom, and in the Logos doctrine of Judæo-Alexandrian philosophy, some approximations to this conception of the Divine may be traced, but they fell far short of it. According to the New Testament, God is not merely infinitely exalted above the world and definitely distinguished therefrom, nor merely immanent and everywhere operative in nature, but also incarnate in Christ; and Christ is not merely "the Son of man," essentially sharing in humanity and truly representing it before God, but also "the Son of God," essentially sharing in Divinity, and giving the fullest disclosure of it to man. The foundation of the Christian faith as laid down in the New Testament is that Christ through His unique relation as Son to the Father perfectly declared and expressed the nature and will of God in relation to human salvation. Thirdly, God is exhibited in the New Testament as the Spirit, the Holy Ghost, who dwells in the spirits of men, to work in them the will of the Father, and to conform them to the image of the Son.

The threefold representation of God in the New Testament was an entirely religious and practical representation, inseparably connected with the historical facts of Christ's life and the spiritual experiences of the early Christians. It was not an ontological or even theological doctrine, and will be identified by no competent exegete with the dogma of the Divine Trinity set forth in the œcumenical creeds. The propositions constitutive of the dogma of the Trinity—the propositions in the symbols of Nice, Constantinople, and Toledo relative to the immanent distinctions and relations in the Godhead—were not drawn directly from the New Testament, and could not be expressed in the New Testament terms. They were the products of reason speculating on a revelation to faith—the New Testament representation of God as a father, a redeemer, and a sanctifier—with a view to conserve and vindicate, explain and comprehend it. They were only formed through centuries of effort, only elaborated by the aid of the conceptions and formulated in the terms of Greek and Roman metaphysics. The evolution of the doctrine of the Trinity was far the most important fact in the doctrinal history of the church during the first five centuries of its post-apostolic existence. To trace and describe it fully would be almost to exhibit the history of Christain thought during these centuries. It had necessarily an immense influence on the development of theism. The acceptance of the catholic doctrine of the Trinity implied the rejection of pantheism, of abstract monotheism, of all forms of monachianism or unitarianism. It decided that theistic development was not to be on these lines or in these directions. At the same time the dogma itself was a seed for new growths of theistic thought, and demanded a development consistent with its own nature.

It was the general conviction of the early Christian writers that formal proofs of the Divine existence were neither necessary nor useful. In their view the idea of God was native to the soul, the knowledge of God intuitive, the mind of man a mirror in which, if not rusted by sin, God could not fail to be reflected. The design argument, however, came early into use and was frequently employed. More speculative modes of reasoning were resorted to by Dionysius of Tarsus, Augustine, and Boetius. The unity of God had to be incessantly affirmed against polytheists, Gnostics, and Manichæans, The incomprehensibility of God and His cognoscibility were both maintained, although each was sometimes so emphasized as to seem to obscure the other. That the knowledge of God may be reached by the three ways of *causality*, *negation*, and *eminence* was implied by the pseudo-Dionysius, although only explicitly announced by Scotus. Neither any systematic treatment of the Divine attributes nor any elaborate discussion of single attributes was attempted. The hypothesis of eternal creation found a vigorous defender in Origen, but met with the same fate as the dualist hypothesis of uncreated matter, and the pantheistic hypothesis of emanation. Of all the patristic theologians Augustine was undoubtedly the most philosophical apologist and exponent of theism. He alone attempted to refute agnosticism, and to find a basis for the knowledge of God in a doctrine of cognition in general. On the large, difficult, and as yet far from adequately investigated subject, the influence of Platonic and Aristotelian, Stoic and Academic, Neopythagorean and Neoplatonic speculation on the formation of the Christian *doctrina de Deo*, it is, of course, impossible here to enter.

Mohammed (570-632) founded a monotheistic religion which spread with amazing rapidity through Arabia, Syria, Persia, North Africa, and Spain, and gave, almost wherever it spread, a mighty impulse to the minds and wills of men. It was received as the gift of special inspiration and revelation, although its creed contained little of moment on which reason would seem to be incompetent to decide. It had obvious merits, and must be admitted to have rendered real and important services to culture, religion, and humanity, but had also conspicuous faults, which have done much injury to individual, domestic, and national life. If the latest were always the best, it would be the most perfect of the three great theistic religions of the world; but it is, in fact, the least developed and most defective. Mohammedanism is almost as contrary to Christianity as one form of theism can be to another. It is as unitarian as Christianity is trinitarian. Its cardinal tenet is as distinctly anti-trinitarian as anti-polytheistic. It has often been represented as having had the providential task assigned it of preparing the way for Christianity by destroying polytheism; in reality, it has hitherto offered a far more stubborn resistance to Christianity than any polytheistic religion has done.

The mediæval world was so complex, so full of contrasts and contradictions, that it cannot be "summed up in a formula." Most general statements current regarding it will be found on examination only partially true. It is often described as the age in which external religious authority ruled, and all religious thought ran in narrow, strictly prescribed paths, whereas, in fact, the mediævel theologians were far freer to speculate on almost all points of religious doctrine than Protestant divines have been. Because traditionalism abounded, it is forgotten that rationalism also abounded; because scholasticism flourished, that mysticism was prevalent; because theism was common, that pantheism, speculative and practical, was not uncommon. The Middle Age was, however, *par excellence* the age of theology. Theology never before or since so interested and dominated the human intellect. Nearly every eminent mediæval thinker was a theologian. The chief streams of theistic belief and speculation which traversed the Middle Age were three—the Christian, Jewish, and Mohammedan. The first was much the broadest and fullest. Few points of theistic doctrine were left unhandled by the Christian divines of the Middle Age. The conclusions come to on the chief points were various and divergent. As to the manner in which God is known, for instance, some laid stress on faith or authoritative revelation; others on immediate consciousness, the direct vision of the pure in heart, the illumination of the Spirit of God in the minds and hearts of the true children of God; others on reason and proof; and some attempted mediation and synthesis. Anselm gave logical form to an *a priori* argument for the divine existence based on the idea of God as a being than whom a greater cannot be conceived. His most ingenious attempt to demonstrate the absurdity of supposing the perfect, the infinite, to be a mere subjective fiction prepared the way for the multitude of attempts, identical or similar in aim, which have since been made. Thomas Aquinas was the best representative of those who held that the invisible God was only to be known through His visible works. He argued from motion to a mover, from effect to cause, from the contingent to the necessary, from lower kinds of good to a supreme good, and from order and purpose in the world to a governing intelligence. Raymond of Sebonde added to the ontological and physico-teleological arguments a moral argument. William of Occam criticized keenly and unfavorably both the *a priori* and *a posteriori* proofs, and held that the existence of God was not a known truth, but merely an article of faith. There was not less diversity of view as to how far God may be known. Erigena held that even God himself could not comprehend His own nature, and Eckhart that the nature of God is necessarily unknowable, as being a nature without nature, without predicates, without opposites, pure oneness. That man cannot know God's real nature, cannot know him *per essentiam*, cannot have a *quidditiva cognitio Dei*, and that the so-called attributes of God are only descriptive of the effects of His operations as they appear to the human mind, or even are merely symbols or metaphors, was maintained by many of the scholastic doctors. Aquinas, for example, with all his confidence as a dogmatic system-builder, so denied the cognoscibility of God. That the human mind may have a true, although it cannot have a perfect, knowledge of God—an apprehensive but not a comprehensive knowledge of Him—was, however, in the Middle Age, as it has been ever since, the position most commonly taken up.

Mohammedan theism drew chiefly from faith and fanaticism the force which carried it onward with such rapidity in its early career of conquest. At the same time it powerfully stimulated reason, as soon appeared in remarkable intellectual achievements. Of course, reason could not fail to reflect on the contents of the faith by which it had been awakened. The result was the formation of many schools of religious opinion. So far as our subject is concerned, however, all mediæval Mohammedan thinkers may be ranked as philosophers, theologians, or mystics. The philosophers derived little of their doctrine from Mohammed. Even in what they taught regarding God they followed mainly Aristotle, and in some measure the Neoplatonists. They maintained the unity of God, but conceived of it in a way unknown to Mohammed, namely, as a unity allowing of the reality of no distinctions, qualities, or attributes in God. Then, although they affirmed the unity of God in the strictest abstract manner, they were not monists but dualists, inasmuch as they denied creation *ex nihilo*, and asserted the eternity of matter. The mode in which they supposed the multiplicity of finite things to have been produced from God was by a series of emanations originating in Divine intelligence, not in Divine will. Their proofs of the Divine existence were, for the most part, founded on the principle of causality. The philosophers did not openly oppose the theism of the Koran, but they ignored it or set it aside, and represented it as only a useful popular faith, not a response to the demands of cultured reason. The "theologians" on the other hand, took their stand upon the Koran, sought to defend and develop into doctrine its representations of God, and to show the inconclusiveness and inconsistencies of the teaching of the philosophers regarding God. Even those of them, however, who exalted faith and revelation most—the orthodox Motakallemin or Asharites—by no means dispensed with philosophy and reason. It was chiefly on the metaphysical hypothesis of the atomic constitution of matter that they rested their proofs of the Divine existence. It was by subtle reasonings that they sought to establish the non-eternity of matter and the unity and immateriality of God. It was on speculative grounds that they contended God had eternally possessed all the attributes ascribed to Him in the Koran. Their predestinationism was as logically elaborated as that of the Augustinian scholastics. There flourished for a short period a school of liberal Mohammedan theologians, the Motazilites, who, while accepting the two fundamental doctrines of Islam —the unity of God and the divine mission of Mohammed—refused to regard the Koran as an absolute religious authority, and sought to transform Mohammedanism into a reasonable and ethical monotheism. They insisted on the rightful conformity of faith to reason, on human freedom, and on the righteousness as well as the unity of God. They endeavored, in fact, to substitute for a God whose essence was absolute or arbitrary will a God whose essence was justice. This meant, however, not to develop or even reform, but to subvert and displace the Mohammedan idea of God, and the wonder is, not that they failed in so arduous a task, but that they had the courage to undertake it. Mohammedan mysticism (Sufism) was a reaction, chiefly of the Persian mind, against the narrowness and harshness of the monotheism of the Arabian prophet. Unlike philosophy, it was not a mere exotic, but an indigenous growth within the Mohammedan area, and hence orthodoxy has never been able to eradicate it.

Jewish and Mohammedan religious thought were intimately connected in the Middle Age, and ran a nearly parallel course. The Rabbanites and the Karaites of Judaism corresponded to the orthodox and the Motazilites of Mohammedanism. In their theism there was no new feature or peculiar significance. Jewish theosophic mysticism found expression in the Kabbalah. The idea of God there presented was at once excessively abstract and excessively fanciful. It must be studied, however, in the original source or in special works. The Jewish philosophers differed little from the Arabian philosophers in their teaching regarding the evidences of the Divine existence, the nature and consequences of the Divine unity, and the meaning of the Divine attributes. At the same time, they, with a few exceptions, affirmed the non-eternity of matter, and did not, like the Arabian Aristotelians, represent providence as merely general. They maintained strongly the transcendence of God and the impossibility of the human mind forming any positive conception of His essential being. They held that He was known as necessarily existent, but also as in Himself necessarily unknowable. Their view of the unity of God led them to an idea of God which may not unjustly be designated agnostic, and which prevented their regarding either nature or Scripture as a revelation of what God really is. Almost alone among eminent Jewish writers of the Middle Age, Jehuda Halevi contended that the representation of God given in the revelation to Israel was self-evidencing, independent of the support of philosophy, and unattainable in any speculative way.

In Christian Europe the human mind took a fresh start at the epoch of the Renaissance. It revolted against the authorities to which it had long been submissive, and exercised private judgment with a confidence uncorrected and unmoderated by experience. It turned with ardor to the free discussion of the greatest theme of thought, and probably at no period of history has there been more individual diversity of opinion on that theme.

The fusion of theology and philosophy was the distinctive feature of mediæval Christendom; their separation has been a marked characteristic of modern Christendom. Even when both have been occupied with religious inquiries and thoughts of God they have kept apart; they have often coöperated, but seldom commingled. Theology has been on the whole cleric, and comparatively conservative; philosophy has been on the whole laic, and comparatively progressive. But for philosophy, restlessly seeking ever more light, there would have been little growth or increase of knowledge of the Divine.

The Reformers held that there was a knowledge of God naturally planted in the human mind, and also derivable from observation of the constitution and government of the world, but that this knowledge was so marred and corrupted by ignorance and sin as to require to be confirmed and supplemented by the far clearer and fuller light of the special revelation in the Scriptures. They were deeply sensible of the evils which had arisen from the over-speculation of the scholastic divines on the nature of God, and were under the impression that it would have been well if men had been content to accept the statements of Scripture on the subject with simple and unhesitating faith. In the confessions of the churches of the Reformation nothing which the ancient church had œcumenically determined as regards that doctrine was rejected, and nothing new was added thereto. It soon became apparent, however, that the mind would by no means confine its thoughts of God within the limits which the Reformers believed to be alone legitimate and safe. The idea of God is so central in religion that it must affect and be affected by every change of thought on any religious theme. The many and violent controversies within Protestantism all reacted on the doctrine relative to Deity, causing it to be studied with intense energy, but in a manner and spirit very unfavorable, on the whole, to truth and piety. Every new dispute elicited more abstruse conclusions and more subtle definitions. The scholasticism of Protestantism was in essential contradiction to the genius and aim of Protestantism. Then, in the Protestant doctrine of God more prominence was given than had previously been done to His manifestation in redemption, to the relation of His character toward sin, and, in particular, to the attribute of justice. The strong emphasis laid on the righteousness of God marked a distinct ethical advance. At the same time the idea of God in the older Protestant theology was far from ethically complete.

Difference of opinion as to the relation of reason to Scripture was in the Protestant world one of the chief causes of difference of belief as to God. Assaults on trinitarianism were contemporary with the Reformation, and they proceeded more on the conviction that the doctrine of the Trinity was unreasonable than that it was unscriptural. The founder of Socinianism, indeed, not only fully accepted the authority of Scripture, but went so far as to represent it as the source of all religious truth, even of the primary truths of natural religion; yet, while he thus apparently and in theory attributed the knowledge of God more to Scripture and less to reason than did Luther or Calvin, really and in practice he did just the reverse, because he conceived quite otherwise of the connection between Scripture and reason. Antitrinitarianism has maintained its ground throughout the Protestant area, has assumed a variety of forms, and has exerted a powerful influence. It has been unable, it is often said, to do more than revive the doctrines which distracted the ancient church and were condemned by it as heresies. And this must be so far admitted. The doctrine of the Trinity comprehends only a few propositions, and every departure from it must involve a rejection of one or more of these, and must, consequently, belong to some one of a very few possible types or classes of belief. But essentially the statement is superficial and unjust; for the ways in which, and the grounds on which, both the affirmations of which the doctrine consists and the negations of these have been maintained have not been the same. Alike the defenses and the attacks have in the later era implied a deeper consciousness of the nature of the problems in dispute than those of earlier times. As of history in general, so of the history of the doctrine of God, it holds good that no present has been the mere reproduction of any past. The rationalistic process was carried farther in English deism and its Continental developments. Deism sought to found religion on reason alone. It represents "nature" as the sole and sufficient revelation of God. There is no warrant for the view that the deists held nature to be independent of God, self-conservative and self-operative—or, in other words, God to be withdrawn from nature, merely looking on and "seeing it go." They believed that God acted through natural laws, and that it was doubtful if He ever acted otherwise than through these. Whatever was taught about God in Christianity and other positive religions beyond what reason could infer from nature ought, in their opinion, to be rejected as fiction and superstition. All their zeal was negative—against "superstition." What was positive in their own doctrine had but a feeble hold on them. God was little more to them than a logical inference from the general constitution of the world. They lacked perception of the presence of God, not only in the Bible, but in all human life and history.

Modern philosophy, from its rise to the close of the eighteenth century, showed a double development, the one ideal and the other empirical, the Cartesian and the Baconian. The former was the more essentially religious. Descartes endeavored to found philosophy on an indubitable refutation of absolute skepticism. Such a refutation he believed himself to have effected when he had argued that thought, even in the form of doubt, necessarily implies the existence of him who thinks; that the implication yields a universal criterion of certainty; and that the presence of the idea of God in a man's mind, the consciousness of the mind's imperfection, and especially the character of the mind's concept of God as that of the most real being containing every perfection, demonstratively establish that God is and is what He is thought to be. God is and is true; therefore man has not been made to err, and whatever he clearly and distinctly sees as true must be true. In the opinion of Descartes, the idea of God is inherent in reason, is the seal of all certainty, and the corner-stone of all true philosophy. To the whole Cartesian school theology was the foundation of all science. To Spinoza, who most fully developed some of the distinctive principles of Descartes, it was identical with all science, for to him God was the only substance, and all things else were only His attributes or modes. Besides the pantheism of Spinoza, the occasionalism of Guelinx, Malebranche's vision of things in God, Leibnitz's pre-established harmony and optimism, and Wolf's rationalism were natural, if not necessary, outgrowths from the same root—Cartesian theism. Perhaps, of all the many services to the cause of theism with which Cartesianism must be credited the greatest was that it constantly gave prominence to the absolute perfection of God.

In the sixteenth, seventeenth, and eighteenth centuries mysticism had many representatives, several of whom, as, *e.g.*, Weigel, Ottingen, Swedenborg, and especially Jacob Boehme, are entitled to a considerable place in any detailed history of theism. To the eyes of Boehme God revealed Himself from without and within in the most real and intimate manner. His thoughts of God were in striking contrast to those of the deists and natural theologians of the seventeenth and eighteenth centuries, and strikingly anticipated those of a Schelling, Hegel, and Baader in the nineteenth century.

The nineteenth century is sufficiently far advanced to allow us to see that a new epoch even in the history of theism began near its commencement. The revolution in philosophy initiated by Kant has profoundly affected theistic thought. It has introduced that type of agnosticism which is what is most original and distinctive in the antitheism of the present age, and at the same time stimulated reason to undertake bolder inquiries as to the Divine than those which Kant prohibited. The enlarged and deepened views of the universe attained through the discoveries of recent physical science have rendered incredible the idea of a God remote from the world, irresistible the conviction that the eternal source of things must be immanent in their constitution, changes, and laws. The rapid growth of biology and the spread of the doctrine of evolution have not only tended in the same direction, but given a new and nobler conception of the teleology of the universe, and, consequently, of God as the supreme intelligence. History—which the natural theologians of the eighteenth century so strangely ignored, which the solitary Italian thinker Vico alone recognized with clearness and comprehensiveness of vision to be necessarily the chief scene of the self-revelation of God—began with Lessing and Herder to be generally seen in its true religious light. The comparative or historical method of study has created two disciplines or sciences—comparative theology and Biblical theology—which are both largely occupied with tracing the development of the idea of God. The ethical spirit of the age has so told on its religious teaching that to no generation save that to which the gospel was originally given has the Divine fatherhood been so distinctly set forth as to the present. Dogmatic theology, especially in Germany, has been earnestly active; and its chief representatives have labored so to amend and advance the doctrine concerning God that it may satisfy the new requirements which have arisen.

THEMIS, the Greek mythological personification of custom. In Homer the word occurs both in the singular and in the plural (themistes), with the sense of "custom," "unwritten law." But even in Homer Themis is also spoken of as a goddess who, at the command of Zeus, calls the gods to an assembly and summons or disperses the assemblies of men. But after all she is a thin abstraction, a faint shadow, by the side of the full-blooded gods of Olympus.

THEMISTIUS, named εὐφραδής or "the well-languaged," was a rhetorician and philosopher of the latter half of the fourth century. Of Paphlagonian descent, he settled and taught at Constantinople. Thence he was called to Rome, but, after a short stay in the West, returned to the Eastern capital, where he resided during the rest of his life. Though a Pagan, he was admitted to the senate by Constantius in 355. He was prefect of Constantinople in 384 on the nomination of Theodosius. Themistius' paraphrases of Aristotle's *Posterior Analytics*, *Physics*, and *De Anima* are deservedly esteemed; but weariness and disgust are the sentiments stirred by the servile orations in which he panegyrizes successive emperors, comparing first one and then another to Plato's "true philosopher," and, when all other compliments have been exhausted, to the "idea" itself.

THEMISTOCLES was born in the latter part of the sixth century B.C., some time during the rule of the Pisistratidæ at Athens. As he was rising to political distinction, he had for his rival the Greek "Cato," the incorruptible Aristides, a purer patriot, a better citizen, but a less sagacious and far-seeing statesman. The two men were in sharp antagonism as to what their country's policy should be, and it ended in a vote of ostracism which sent Aristides into temporary banishment in 483. The main question between them probably was whether Athens should seek greatness by sea or by land, and the victory of the policy of Themistocles led on to the most brilliant era in Greek history, the maritime supremacy of Athens. It was a great achievement when he finally prevailed on his fellow-citizens to quit their city and their homes—it seemed forever—and to trust themselves to their ships. Xerxes and his host were now laying waste Attica, not, however, before its inhabitants had conveyed their families to the adjacent island of Salamis, where also the Greek fleet had taken up its station, the Persian armada of 1,200 vessels being in harbor at Phalerum.

It was clear that the fate of Greece now depended on the action of the Athenians and on the prudence and ability of Themistocles, by whom they were guided. The Greeks of the Peloponnese, more particularly the Corinthians, were for moving the fleet from Salamis to the isthmus, as the enemy's land forces were already in possession of the neighboring shores of Attica. Seeing the danger of yet further disunion, with the probable result of the breaking up and dispersion of the fleet, and having in vain protested against quitting their present station, Themistocles went straight to the Spartan admiral, Eurybiades, and induced him to call another council. There was much angry debating, till at last the Spartan felt he must yield to the threat of Themistocles that the Athenians would either fight at Salamis or sail away as they were to Italy. But the Peloponnesian Greeks were still dissatisfied, and insisted that they ought to be at the isthmus for the defense of what yet remained of Greece; a third council was held, and Themistocles felt that its decision would be against him, when, by a sudden happy thought, he contrived to have a secret message conveyed to the commanders of the Persian fleet through his slave, an Ionian Greek from Asia, a man of intelligence and education, and well acquainted with the Persian language. The communication came in the name of Themistocles, who professed that he wished well to the king, and that now was a good opportunity for attacking and crushing the Greeks, as they were divided among themselves and were bent on flight. The stratagem was successful, and the enemy's great armada advanced along the coast of Attica that same night, and took up a position which effectually confined the Greek fleet within the narrow strait between Salamis and the southern shore of Attica. The Greek captains, not knowing the state of the case, were still wrangling through the night, when just before daybreak the banished Aristides came from Ægina with the news that the Persian fleet was close at hand and that retreat was impossible. "Let us still be rivals," he said to Themistocles, "but let our strife be which can best save our country."

The great victory of Salamis left Greece mistress of the sea, and was followed by the retreat of Xerxes. After the victories of Platæa and Mycale in 479 the Athenians went back to their desolate city and began to rebuild and fortify it. Jealous fears of the growing power of Athens were awakened, and the Spartans, as representatives of the Greeks generally, formally protested against the fortification of a Greek city outside the Peloponnese, on the ground that some future Persian invader might make it a base of operations. Themistocles saw the dangers of Spartan opposition, and got the Athenians to commission him to arrange matters along with two other envoys, who, however, were purposely not allowed to arrive at Sparta at the same time as himself. He told the Spartan magistrates that before he could transact business with them he must wait for his colleagues; meanwhile Athens was being fortified, every man, woman, and child putting a hand to the work, and as soon as Themistocles understood that it was sufficiently advanced he declared openly that Athens would brook no sort of interference. The Spartans felt that they had been tricked, but they could do nothing.

A few years afterward (in 471 probably) we find his political career terminated by a vote of ostracism, due perhaps in part to Spartan influence at Athens, and also to an offensive boastfulness and ostentation which disgusted the sensitive Athenian democracy. He was even charged with corrupt practices and with receiving bribes from Persia. From Argos, whither he had retired as an exile, he was forced to flee by a threat of the Spartans, who alleged that they had proofs of his treasonable complicity in the schemes of their countryman Pausanias, and to take refuge in the island of Corcyra; but here again he was pursued by Spartan and Athenian commissioners, and driven to seek the protection of Admetus, king of the Molossians, the chief people of Epirus. In the court of this half-Greek, half-barbarian prince he found a hospitable reception, and he was furnished with the means of crossing the Ægean to Ephesus. Shortly after his arrival in Asia, the son of Xerxes, Artaxerxes, succeeded to the throne of Persia, and to him Themistocles contrived to make himself known as a fugitive from ungrateful Greece, which he had saved, and now ready and willing to advise and assist the king in avenging his father's defeat. He was treated, it is said, with marked respect, and was liberally pensioned with the revenues of three wealthy towns—Magnesia, Myus, and Lampsacus. It was at the first of these, which was near the coast, and whence he might be supposed to have opportunities for watching the affairs of Greece, that he passed the last year of his life, dying a natural death at the age of sixty-five. The year of his death is not accurately ascertainable; opinions vary between 460 and 447.

THÉNARD, LOUIS JACQUES, was born on May 4, 1777, at Louptière, near Nogent-sur-Seine, in Champagne. His father, though a poor man, sent him to the academy of Sens, where he received a liberal education. At the age of sixteen he went to Paris to study pharmacy. He attended the lectures of Fourcroy and Vauquelin.

By and by Vauquelin gave him an opportunity o testing his powers as a lecturer. Having to go for some days to the country, he asked Thénard to take his place. For the first two or three lectures his attention was fixed on his work, and his eyes did not wander from the lecture table. On the fifth day he ventured to look round the room, when to his consternation he saw Fourcroy and Vauquelin among the audience. They were so satisfied with what they had heard that they obtained for Thénard in 1797 an appointment as teacher of chemistry in a school, and in 1798 the post of repétiteur at the École Polytechnique.

In 1804 Vauquelin resigned the professorship of chemistry at the Collége de France, and successfully used his influence to have Thénard appointed. In 1810 he succeeded Fourcroy both as professor of chemistry at the École Polytechnique and as member of the Academy. He was also appointed professor of chemistry in the faculty of the sciences. He was made a chevalier of the Legion of Honor in 1814, commander in 1837, and grand officer in 1842. In 1825 Charles X. gave him the title of baron; from 1827 to 1830 he represented the department of Yonne in the chamber of deputies. In 1832 Louis Philippe made him a peer of France. As vice-president of the conseil supérieure de l'instruction publique, he exercised a great influence on scientific education in France. He died June 21, 1857.

THEOBALD, LEWIS, will survive as the prime butt of the original *Dunciad*, when as a playwright, a littérateur, a translator, and even as a Shakespearean commentator, he will be entirely forgotten. The son of an attorney, Theobald was born at Sittingbourne, in Kent, England, in 1688. He died in 1774.

THEOBROMINE ($C_{14}H_8N_4O_4$) is a crystallizable principle present in chocolate. It is extracted from the cocoanuts (the seeds of *Theobroma cacao*) in the same manner as caffeine or theine is extracted from the coffee, tea, etc., in which that substance occurs. It is less soluble in water than caffeine, but resembles that substance in forming crystallizable salts with some of the acids. By dissolving theobromine in a solution of ammonia, and adding nitrate of silver, a gelatinous precipitate is obtained, which, by boiling with a solution of ammonia, yields a crystalline mass of theobromide of silver ($C_{14}H_7A_9N_4O_4$) in which one equivalent of hydrogen is replaced by one of silver. This compound, when treated with iodide of methyl, yields iodide of silver and caffeine, which latter may be extracted with alcohol. Hence we arrive at the remarkable conclusion that caffeine ($C_{16}H_{10}N_4O_4$) must be regarded as methyl-theobromine $C_{14}H_7(C_2H_3)N_4O_4$.

THEOCRACY, literally, government by God, is the condition of government in which the Almighty is considered as the supreme head and sole sovereign; the laws, therefore, instead of being human and fallible, are looked upon as divine commands. As a matter of course the priesthood, as the sole interpreters of the supposedly divine ordinances, necessarily assumed a spiritual power in such a government. The most famous example of a theocracy is that established by Moses among the Hebrews.

THEOCRITUS, of Syracuse, the foremost Greek pastoral poet, lived a life of which nothing is known except from allusions in his own works. The epigram appended to his poems makes him say, "I am a Syracusan, a man of the people, a son of Praxagoras and Philinna." He must have been born early in the third century, among a Dorian people, whose Dorian speech survives in his rural idyls. These "little pictures" chiefly represent the life of shepherds, neat-herds, and fishermen in the woods and on the shores of Sicily. They are doubtless inspired by the popular poetry of his time, and have much in common with the Romaic chants of the modern Greek shepherds.

On a general view, Theocritus' surviving poems turn out to be—(1) rural idyls, the patterns of Virgil's eclogues, and of all later pastoral poetry; (2) minute epics, or cabinet pictures from mythology; (3) sketches of contemporary life in verse; (4) courtly compositions; and (5) expressions of personal kindliness and attachment. The first category and the third are those on which the fame of Theocritus depends. His verse has a wonderful Doric melody; his shepherds are natural Southern people: it is not his fault that what he wrote truly of them has become a false commonplace in the pastoral poetry of the North.

THEODOLITE. See SURVEYING.

THEODORA, the wife of the emperor JUSTINIAN (*q.v.*), was born probably in Constantinople, though according to some in Cyprus, in the early years of the sixth century, and died in 547. According to Procopius, she was the daughter of Acacius, a bear-feeder of the amphitheater at Constantinople to the Green Faction, and while still a child was sent onto the stage to earn her living in the performances called mimes. She had no gift for either music or dancing, but made herself notorious by the spirit and impudence of her acting in the rough farces, as one may call them, which delighted the crowd of the capital. Becoming a noted courtesan, she accompanied a certain Hecebolus to Pentapolis (in North Africa), of which he had been appointed governor, and having quarreled with him, betook herself first to Alexandria, and then back to Constantinople through the cities of Asia Minor. In Constantinople (where, according to a late but apparently not quite groundless story, she now endeavored to support herself by spinning, and may therefore have been trying to reform her life) she attracted the notice of Justinian, then patrician, and, as the all-powerful nephew of the emperor Justin, practically ruler of the empire. He desired to marry her, but could not overcome the opposition of his aunt, the empress Euphemia. After her death (usually assigned to the year 523) the emperor yielded, and, as a law, dating from the time of Constantine, forbade the marriage of women who had followed the stage with senators, this law was repealed. Thereupon Justinian married Theodora, whom he had already caused to be raised to the patriciate. They were some time after (527) admitted by Justin to a share in the sovereignty; and, on his death, four months later, Justinian and Theodora became sole rulers of the Roman world. He was then about forty-four years of age, and she some twenty years younger. Theodora speedily acquired unbounded influence over her husband. He consulted her in everything, and allowed her to interfere directly, as and when she pleased, in the government of the empire. She had a right to interfere, for she was not merely his consort, but empress regnant, and as such entitled equally with himself to the exercise of all prerogatives.

In the religious strife which distracted the empire Theodora took part with the Monophysites, and her coterie usually contained several leading prelates and monks of that party. As Justinian was a warm upholder of the decrees of Chalcedon, this difference of the royal pair excited much remark and indeed much suspicion. Many saw in it a design to penetrate the secrets of both ecclesiastical factions, and so to rule more securely. In other matters also the wife spoke and acted very differently from the husband; but their differences do not seem to have disturbed either his affection or his confidence. The maxim in Constantinople was that the empress was a stronger and a safer friend than the emperor; for, while he abandoned his favorites to her wrath, she stood by her protégés, and never failed to punish any one whose heedless tongue had assailed her character.

Theodora bore to Justinian no son, but one daughter,—at least it would seem that her grandson, who is twice mentioned, was the offspring of a legitimate daughter, whose name, however, is not given. According to Procopius, she had before her marriage become the mother of a son, who when grown up returned from Arabia, revealed himself to her, and forthwith disappeared forever; but this is a story to be received with distrust. That her behavior as a wife was irreproachable may be gathered from the fact that Procopius mentions only one scandal affecting it. Her health was delicate, and, though she took all possible care of it, frequently quitting the capital for the seclusion of her villas on the Asiatic shore, she died comparatively young. Theodora was small in stature and rather pale, but with a graceful figure, beautiful features, and a piercing glance.

THEODORE OF MOPSUESTIA, the most eminent representative of the so-called school of Antioch, the beginnings of which date from about the middle of the third century. He was born at Antioch about the middle of the fourth century. He died in 428 or 429, toward the beginning of the Nestorian controversy.

THEODORE, the name of two popes. Theodore I., pope from November, 642, till May, 649, succeeded John IV. He was the son of a bishop, and was born in Jerusalem. A zealous opponent of monothelitism, in the course of the protracted controversy he in a Roman synod excommunicated Pyrrhus, patriach of Constantinople, and signed the document with ink mingled with consecrated wine. Theodore II. had a pontificate of only twenty days (Nov.–Dec., 897).

THEODORE, KING. See ABYSSINIA.

THEODORET, bishop of Cyrus, and an important writer in the domains of exegesis, dogmatic theology, church history, and ascetic theology, was born in Antioch, Syria, about 390. At an early age he entered the cloister; and in 423 he became bishop of Cyrus, or Cyrrhus, a small city between Antioch and Euphrates, where, except for a short period of exile, he spent all the rest of his life. The date of his death is uncertain, but it must have been at least six or seven years later than the council of Chalcedon (451). Although thoroughly devoted to the ideals of monasticism, he discharged his episcopal duties with remarkable zeal and fidelity. He was diligent in the cure of souls, laboring hard and successfully for the conversion of the numerous Gnostic communities and other heretical sects which still maintained a footing within the diocese. He himself claims to have brought more than a thousand Marcionites within the pale of the church, and to have destroyed many copies of the *Diatessaron* of Tatian, which were still in ecclesiastical use.

THEODORIC, king of the Ostrogoths, was born about the year 454, and was the son of Theudemir, one of three brothers who reigned over the East Goths, at that time settled in Pannonia. At the age of seven he was sent as a hostage to the court of Constantinople, and there spent ten years of his life, which doubtless exercised a most important influence on his after career. Shortly after his return to his father (about 471) he secretly, with a *comitatus* of 10,000 men, attacked the king of the Sarmatiams, and wrested from him the important city of Singidunum (Belgrade). In

473 Theudemir, now chief king of the Ostrogoths, invaded Mœsia and Macedonia, and obtained a permanent settlement for his people near Thessalonica. Theodoric took the chief part in this expedition, the result of which was to remove the Ostrogoths from the now barbarous Pannonia, and to settle them as "fœderati" in the heart of the empire. About 474 Theudemir died, and for the fourteen following years Theodoric was chiefly engaged in a series of profitless wars, or rather plundering expeditions, partly against the emperor Zeno, but partly against a rival Gothic chieftain, another Theodoric, son of Triarius. In 488 he set out at the head of his people to win Italy from Odoacer. The invasion and conquest of Italy occupied more than four years (488–493). Theodoric, who marched round the head of the Venetian Gulf, had to fight a fierce battle with the Gepidæ, probably in the valley of the Save. At the Sontius (Isonzo) he found his passage barred by Odoacer, over whom he gained a complete victory (August 28, 489). A yet more decisive victory followed on September 30th at Verona. Odoacer fled to Ravenna, and it seemed as if the conquest of Italy was complete. It was delayed, however, for three years by the treachery of Tufa, an officer who had deserted from the service of Odoacer, and of Frederic the Rugian, one of the companions of Theodoric, as well as by the intervention of the Burgundians on behalf of Odoacer. A sally was made from Ravenna by the besieged king, who was defeated in a bloody battle in the Pine Wood. At length (February 26, 493) the long and severe blockade of Ravenna was ended by a capitulation, the terms of which Theodoric disgracefully violated by slaying Odoacer with his own hand (March 15, 493). See ODOACER.

The thirty-three years' reign of Theodoric was a time of unexampled happiness for Italy. Unbroken peace reigned within her borders (with the exception of a trifling raid made of Byzantine corsairs on the coast of Apulia in 508). Theodoric's death occurred on August 30, 526. He was buried in the mausoleum which is still one of the marvels of RAVENNA (*q.v.*), and his grandson Athalaric, a boy of ten years, succeeded him, under the regency of his mother, Amalasuntha.

THEODOSIA, or KAFFA, a seaport and district town of Russia, situated on the east coast of Crimea, sixty-nine miles to the east-northeast of Simpheropol. The want of railway communication with the interior prevents it from gaining the commercial importance it might otherwise have possessed, so that its population was only 10,800 in 1881—a low figure when compared with the 20,000 it had in 1672 and still more with the figure returned in the last century. Gardening is one of the leading industries; fishing, a few manufactures, agriculture, and trade are also carried on.

THEODOSIUS I., emperor of Rome, surnamed the Great, the son of Theodosius, Valentinian's great general, was born about the year 346. He was a native of Spain, but the exact place of his birth is uncertain (Cauca in Galicia according to Idatius and Zosimus, Italica according to Marcellinus). He accompanied his father into Britain (368), and a little later distinguished himself by defeating the Sarmatians who had invaded Mœsia (374). On his father's death he retired to his native place, where he lived quietly till after the great battle of Adrianople (August 9, 378), when Gratian summoned him to share the empire. Theodosius was made Augustus at Sirmium, January 19, 379, and was assigned all the Eastern provinces, including Illyricum. It was a time of great peril for the Roman state. The Huns had just made their appearance on the western shores of the Black Sea, and, after overthrowing the great nation of the Ostrogoths, had driven the more southern Visigoths to take shelter within the empire. Valens had consented to receive them (376) on condition that they should deliver up their arms and surrender their children as hostages to be distributed throughout the cities of the East. The latter half of the compact was enforced, but not the former; and the barbarians, left without any sustenance, began to plunder the open country. After their great victory at Adrianople they reached the walls of Constantinople, whence they were driven back by the valor of a band of Saracens. Meanwhile the Ostrogoths, the Taifali, the Huns, and the Alans had all crossed the Danube to share the spoils of the empire; and it was against this motley host that Theodosius had to contend. From the unchronological account of a later writer, Zosimus, to whom we owe almost all the details of Theodosius' early campaigns, we may infer that in the course of this year or the next Fritigern and his Visigoths were gradually driven across the Danube, where they seem to have met with the Ostrogoths who had shared their fate.

In 383 Theodosius created his eldest son Arcadius Augustus. The same year saw the revolt of Maximus in Britain and the murder of Gratian (August 25, 383). For five years Theodosius consented to accept the usurper as his colleague; but, when Maximus, flushed with success, attempted a few years later to make himself master of Italy, which, since the sudden death of Valentinian I. (November 17, 375), had been governed under the name of his young son Valentinian II., Theodosius advanced against the invader and overthrew him near Aquileia (July 28, 388). This victory was followed by the murder of Maximus and his son Victor, after whose death Theodosius conferred upon Valentinian II. all that part of the empire which his father had held. Theodosius is said to have been induced to make this campaign by his love for Valentinian's sister, Galla, whom he now married. Meanwhile there had been fresh dangers from the Goths. In 386 another band of the Grœthingi or Ostrogoths, attempting to cross the Danube, was cut off by Promotus. If we may trust the evidence of the historian, Zosimus, from the end of the year 388 Theodosius resigned himself to gluttony and voluptuous living, from which he was only roused by the news that, in the Western empire, Arbogastes the Frank had slain the young emperor Valentinian and set up the grammarian Eugenius in his stead (May 15, 392).

Into the curious history of the short-lived pagan revival in the Western empire there is no need to enter here. Zosimus assures us that the tears of Galla threw the whole court into confusion; but there can be little doubt that to a religious, if not superstitious, mind like that of Theodosius it might well have seemed that he was fighting the battles of God, as he led his army of the cross against an enemy on whose standard shone the image of Hercules (Theodoret, v. 24). His host consisted partly of Romans and partly of barbarians. Timasius was leader of the former, but under him was ranged the more renowned Stilicho; the latter were led by Gainas the Goth and Saul the Alan. The engagement was fought near the river Frigidus, some thirty-six miles distant from Aquileia. On the first day Theodosius' barbarians, engaging with those of the hostile army, were almost destroyed, and the victory seemed to be with Eugenius. After a night of prayer, toward cock-crow the emperor was cheered by a vision of St. Philip and St. John, who, mounted on white steeds, promised him success. With the morning he received and accepted the offer of service on behalf of the enemy's ambush, and once more advanced to the conflict. But even so, the issue of the day was doubtful till, if we may trust the concurrent testimony of all the great contemporary church historians, a sudden gust of wind blew back the enemy's arrows on themselves. This was the turning-point of the battle: Eugenius was slain by the soldiers; and two days later Arbogastes committed suicide (September 5–9, 394). From the northeastern parts of Italy Theodosius passed to Rome, where he had his son Honorius proclaimed emperor under the guardianship of Stilicho. Thence he retired to Milan, where he died of dropsy (17th January, 395), leaving the empire to be divided between his two sons Honorius and Arcadius—Honorius becoming emperor of Rome and the West, Arcadius of Constantinople and the East.

THEODOSIUS II. (401–450) succeeded his father Arcadius as emperor of the East in 408. The chief events of Theodosius' reign are the wars with Persia in 421 and 441, the council of Ephesus (434), and the invasion of the Huns under Attila (441–448). In 450 Theodosius was thrown from his horse while hunting, and received injuries from which he died.

THEODOSIUS III. was the last of three emperors whose short reigns filled the interval between the death of Justinian II. and the accession of Leo the Isaurian. The emperor Anastasius had sent a fleet to frustrate the intended expedition of the Saracens from Alexandria against Constantinople. On reaching Rhodes the troops rose against their leader, John the Deacon, slew him, and, starting for Constantinople, landed at Adramyttium, where they made a collector of the taxes emperor by the title of Theodosius III. The new emperor besieged Constantinople for six months before he took it; Anastasius resigned, and retired to a monastery; leaving his place to be filled by Theodosius III. who likewise resigned next year (717) in favor of Leo III. The closing years of Theodosius' life were spent in a monastery.

THEODOSIUS, of Tripolis, a Greek geometer and astronomer, three of whose works were contained in the collection of lesser writings, named *Ὁ μικρὸς ἀστρονομούμενος* (sc. *τόπος*), or *Ὁ μικρὸς ἀστρόνομος*. These writings, which were highly esteemed in the school of Alexandria, were intermediate between the *Elements* of Euclid and the *Almagest* of Ptolemy, for the understanding of which, indeed, they formed an indispensable introduction. Of the life of Theodosius nothing is known. As to the time when he lived different opinions have been held, he being placed by some in the first century before and by others in the second century of the Christian era.

THEOGNIS OF MEGARA was one of the early Greek elegiac poets; he probably flourished about the middle of the sixth century B.C. We derive our knowledge of his life from the poems that bear his name. After the fall of Theagenes, who had made himself tyrant of Megara about 625, the usual struggles between oligarchy and democracy ensued. Theognis was a violent partisan of the oligarchical faction in his native town, and wrote elegies in which he gave expression to the emotions roused in him by the varying phases of the struggle. He appears on one occasion to have lost his property and to have been driven into exile: perhaps it was then that he visited Sicily, Eubœa, and Sparta. In the end—if we may trust the story—he returned to Megara, and lived, at least for a time, in something like prosperity. The date of his death is unknown.

THEOLOGY. The word theology comes from a heathen source—from the Greek classics (*θεος*, god, and *λόγος*, science).

The words theology and theologian do not occur in Scripture, but it was inevitable that they should be transplanted into Christian soil. *Θεόλογος* is found, as a V.R. in the inscription of the Apocalypse—the Revelation of John "the Divine," "the theologian,"—and almost certainly refers to his maintaining the Divinity of the Logos—*τὴν τοῦ λόγου θεότητα*,—that the *λόγος* is *θεός*. In the third and fourth centuries a theologian usually meant one who distinguishes himself in defending the personality and divinity of the Logos. The term theology has not yet lost its early signification of "doctrine concerning God," although a much wider meaning is more common. Theology in its ordinary general acceptation includes, as one of its divisions, theology understood as the treatment of the problems which directly refer to the being, attributes, and works of God. The *Introductio ad Theologiam*, and a later form of it, the *Theologia Christiana*, composed by Abelard in the twelfth century, first gave currency to our acceptation of the word inclusive of all religious truth or belief. Among later scholastics the common designation for a general compendium of religious doctrine was *Summa Theologiæ*. Of such *Summæ* among the most celebrated and characteristic are those of Alexander Hales, Albertus Magnus, and Thomas Aquinas. The mediæval mystics deemed the essence of theology to be the immediate intuition of God, who, being once in contact with the soul, reveals to it the truth of all the principles of faith, and gives it at the same time spiritual peace and happiness. This view led to a use of the word which was prevalent among the Reformers and their immediate successors—a subjective application which identified it with what was characteristic of the mind of a true theologian, an enlightened and experienced *homo renatus*. In this sense it was a living practical acquaintance with the revelation of grace and truth made by God to man.

The extension given to the signification of the term theology was for a very lengthened period almost universally restricted to the knowledge derivable from the Scriptures, the systematic exhibition of revealed truth, the science of Christian faith and life. It is still thus, perhaps, that the word is most commonly understood. Two things, however, have naturally suggested the employment of it in a wider manner. First, there was the rise and development of a theology not based on revelation—the rise and development of what is called natural theology. The Greeks and Romans could not distinguish between nature and revelation, reason and faith, because ignorant of revelation and faith in their distinctive Christian sense. In the patristic and scholastic ages of the church, and for some time after the Reformation, men were not in general prepared to admit that there was a knowledge of God and of His attributes and of His relations to the world which might be the object of a science distinct from and independent of revelation. Yet the most learned and thoughtful even of the scholastic divines recognized in some measure that such was the case, and could hardly, indeed, do otherwise after they had become acquainted with the contributions which Greek, Jewish, and Arabian philosophers had made to the defense and elaboration of the doctrine concerning God.

Thus natural theology came into reputation, notwithstanding the opposition of those who have denied its existence and contended that reason of itself can teach us absolutely nothing about God or our duties toward Him. The recognition of natural theology contributed to awaken an interest in the various religions of the world, and thus led to the second circumstance referred to, namely, the rise of what may be called comparative theology, although it has hitherto been more generally designated the science of religions. It can be shown to have originated in the attempts made to prove that the principles of natural theology were to be found in all religions. In Bishop Steuco of Kisami's *De Perenni Philosophia*, published in 1540, and in Lord Herbert of Cherbury's *De Religione Gentilium*, published in 1663, we have two of the earliest and most characteristic attempts of the kind. From that time to the present the study of religions has proceeded at varying rates of progress, but without interruption. Important results have been obtained, and especially this result, the ascertainment, to the satisfaction of all competent judges, of a right method of investigation—the establishment, as the true mode of study, of the comparative method. Is theology the science which treats of God? or is it the science which treats of religion? The latter view is now, perhaps, the more current. In addition to intrinsic reasons, the critical and skeptical spirit of the time is in its favor. Many speak of theology as a science of religion because they disbelieve that there is any knowledge of God to be attained.

The definition of theology as the science of religion has been objected to by Dr. Charles Hodge on two grounds:—first, that the word religion is ambiguous, having both an objective sense and a subjective sense, and that its etymology is doubtful; and, second, that to define theology as the science of religion "makes theology entirely independent of the Bible. For, as moral philosophy is the analysis of our moral nature and the conclusions to which that analysis leads, so theology becomes the analysis of our religious consciousness together with the truths which that analysis evolves." As to the first objection, the word religion has, it is true, more significations than one, and consequently may be ambiguously used, but in point of fact it is not so used in the definition in question, in which religion is understood in its generic meaning, and as inclusive both of subjective and of objective religion. Theology has to treat of both, and if it treat of them aright it will not confound them.

There needs, perhaps, no other proof that the definition to which Doctor Hodge objects is of some use than to consider for a moment his own definition. "Theology is the science concerned with the facts and the principles of the Bible." Is theology, then, not concerned with the facts and principles of the physical world, the human mind, and history, so far as these are disclosures of God's nature and ways? How can theology start from the Bible when it needs to be proved that there is a revelation from God in the Bible? And how can this be proved unless it is known from other sources than the Bible that there is a God? If there be such sources, theology must have to do with them; it can have no right to neglect anything by which God may be known or by which light may be thrown on the relations between God and man. It is a service to theology so to define it as to leave no room for asserting that it is only conversant with the Bible.

Theology, then, is the science of religion. What does this definition imply as to the relation of theology to religion? It implies, first, that theology presupposes and is preceded by religion. This is but an instance of the general truth that experience must precede science, and that science must be founded on experience. The implicit use of principles is always prior to their explicit development. Speech is a great deal older than grammar; men reasoned long before Aristotle taught them how they reasoned; and just as there must be speech before grammar, and reasoning before logic, so must there be religion before theology. Secondly, that theology is the science of religion implies that theology must not only succeed religion, but must evolve out of it a system of truths entitled to be called a science. Science is knowledge in its completest, highest, and purest form. Theology, therefore, by claiming to be the science of religion, professes to be the exhibition of religious facts and principles in their most general and precise shape, in their internal relationship to one another, in their organic unity and systematic independence.

But how may man hope to succeed in his efforts to arrive at a scientific understanding of his religious beliefs, feelings, and practices? How may he educe and elaborate from the phenomena of religion a system of theology entitled to be called science? Only, it is obvious, by following a truly scientific method. What then is a truly scientific method in theology? And what is implied in following it? To these questions a comprehensive, although necessarily brief answer must now be given.

A right method in theology, as in all other sciences, is such a use of reason on appropriate facts as will best attain truth. It implies, therefore, as an essential condition, a right relation of reason to religious truth or fact, and to the evidence for it. What the right relation is may, perhaps, be defined with substantial accuracy in the following propositions. (1) Religious truth, like all other truth, is "above reason" in the sense of being not created by but manifested to reason, but is not "above reason" in any special sense which withdraws it from the cognizance of reason. The truths of all science are the discoveries but not the creations of science, and they have been discovered because they existed, because they are the equivalents of a reality which is independent of science. In regard alike to mathematical, physical, mental, and religious truth, reason has only power to seek it, and to find or to miss it; it has no power to make it or right over it, but must accept it as something presented or given to it, and to which it is bound to do homage and yield submission. In this sense all truth is above reason and revealed to reason. In this sense reason stands to religious truth in the same relation as to physical truth, and to Christian truth in the same relation as to the truth in natural religion. Reason is simply the instrument or faculty of apprehending the truth manifested or revealed to it, and it can in no case apprehend truth without the aid of the appropriate manifestation or revelation. (2) Reason in its investigation of religion must be completely free, *i.e.*, subject to no other laws than those which are inherent in its own constitution. In regard to most sciences there is no need to insist that the method of science is one in which reason is free, because all who occupy themselves with these sciences acknowledge it. But in regard to theology it is otherwise. All who call themselves theologians are by no means disposed to admit that reason, in its search for religious truth and in its efforts to construct theological science, must be absolutely free; on the contrary, many of them hold that the church or the Bible, tradition or the common sense of humanity, must be allowed to have a coördinate or even superior jurisdiction. The proposition laid down implies that, if any view of this kind be true, theology is essentially different from science, and it is vain to speak of scientific method in theology. It implies that all claims to religious authority must be based on and conformed to reason, and that all the deliverances of every professedly religious authority must be submitted without reserve or restriction to the reason of the theologian before he can make a scientific use of them. This leads us to another proposition. (3) The only ascertainable limits of reason in the investigation of religious truth, as of other truth, are those which are inherent in its own constitution; and in the search of religious truth, as of all other truth, reason ought to go as far as it can go without violation of the laws of its own constitution. Reason has its limits in its own laws. It is the business of psychology and logic to discover what these laws are. When they are known the powers of reason are known, because reason can never claim to be irrational. It is useless, however, to attempt to mark off the external or objective boundaries of rational research. Human inquiry has, no doubt, external boundaries beyond which it will never pass, but all apparent boundaries of this kind recede as they are approached. Reason cannot investigate too deeply any matter whatever, cannot possibly go too far, so long as it remains reason. Its own laws, the laws of evidence and of inference, are the only discoverable expression of its lawgiver's "thus far." When it violates any of these laws it has gone too far, but only then, and then simply because it has ceased to be rational. As long as it conforms to them the farther it goes the better. All this holds good not less in regard to religion than to any other object of investigation, and is an essential condition of the possibility of religious science. (4) In the study of religion, as in every other department of study, reason should admit nothing as true without sufficient evidence, while rejecting nothing sufficiently proved by evidence of any kind although it cannot be proved by evidence of another kind, or although it may be imperfectly understood or have unsolved difficulties connected with it.

The foregoing conditions are perhaps the most general and fundamental of those to which reason must conform if it would originate and follow a scientific method in theology. The next question which demands an answer is, Whence are the data to be derived on which reason must operate in religious apprehension and theological investigation? What are the sources of religious truth? Reason has not the truth in itself, but in order to possess it must find it. As the eye has not physical light within itself, but merely so corresponds to it as to apprehend it, not otherwise is it with reason and intellectual light. By sources of religious truth can only be meant the media through which God manifests Himself—the ways by which He makes himself known; and the physical world, finite minds, human history, Scripture, and the *testimonium Spiritus Sancti* may all be maintained to be such sources. The atheist and the agnostic will not allow that there are any sources of religious truth; the deist and the rationalist will only admit the claims of general revelation, the exclusive Biblicist only of Scripture; and the mystic will trust chiefly to special spiritual illumination; while the theologian of broader view will hold that all the ways indicated are sources, seeing that in and through them all knowledge and experience as to God and religion may be acquired, and must contend that in the study of theology none of them are to be ignored or excluded, underestimated or overestimated, but all are to be duly considered, and the information supplied by each to be taken in connection with that supplied by the rest. The sources are distinct, but not isolated. The light from each combines and harmonizes with the light from all the others.

The process of theological method itself has next to be considered. Its first step is the ascertainment of the relevant facts. But these are all the facts of nature and history, all the truths of Scripture, and all the phases of religion. The various departments of theology are based on and inclusive of various orders of these facts, and each order of facts must be ascertained and dealt with in appropriate special ways. Thus the relevant data of natural theology are all the works of God in nature and providence, all the phenomena and laws of matter, mind, and history—and these can only be thoroughly ascertained by the special sciences. The surest and most adequate knowledge of them is knowledge in the form called scientific, and therefore in this form the theologian must seek to know them. The sciences which deal with nature, mind, and history hold the same position toward natural theology which the disciplines that treat of the composition, genuineness, authenticity, text, development, etc., of the Scriptures do toward Biblical theology. A conflict between the results of these sciences and the findings of natural theology, is inconceivable. It would be a conflict between the data and conclusions of natural theology, and so equivalent for natural theology to self-contradiction. Then, the data of Biblical theology are all the words contained in the Bible, viewed in their appropriate positions and historical connections, and what these are and signify can only be ascertained by the processes of historical criticism and of hermeneutics. Biblical theology is the delineation of a section of the history of religious ideas—that section of which the traces and records remain in the Bible. The religion of the Bible, however, is but one of a multitude of religions which have left traces of themselves in documents, monuments, rites, creeds, customs, institutions, individual lives, social changes, etc.; and there is a theological discipline—comparative theology—which undertakes to disclose the spirit, delineate the character, trace the development, and exhibit the relations of all religions with the utmost attainable exactitude. Obviously the mass of data which this science has to collect, sift, and interpret is enormous. They can only be brought to light and set in their natural relationships by the labors of hosts of specialists of all kinds. That hypotheses in this domain will for long arise and vanish with disappointing rapidity is only what is to be expected from its vast extent, the amount of its buried wealth, the gradual and fragmentary way in which its contents must be disinterred, the losses and changes which have occurred in the course of time, and the constant suggestion of fresh interpretations of ancient texts and new solutions of old problems which must come from unceasing discovery.

When religious data have been ascertained, the materials of theological science have been obtained, but the scientific edifice itself has still to be constructed. The general truths involved in particular disclosures have to be evolved; the laws of the development of phenomena have to be discovered; elements have to be reached by analysis and comprehensive views by synthesis; laws and facts, fundamental and derivative principles, have to be exhibited in their natural organic connection. This can only be done aright by right methods, and only by a variety of methods. No one-sided process can be appropriate or sufficient. The method must conform to the nature of the matter dealt with and to the end that has to be attained.

It is easy, however, to exaggerate the importance of acquaintance with the formal rules of method laid down by logicians. The theory of method must be preceded by practice—true theory by successful practice; and the ablest practitioners are always only to a small extent guided in their practice by conscious reference to the rules of method prescribed by logicians. In theology, as in all other departments of science, a man can only become an investigator by investigating.

When the data of the theologian are before him as particular facts, it is obvious that he must so enumerate and classify, so analyze and generalize, so correlate and combine them, as to elicit from them the principles which they imply, before either his procedure or results can be properly characterized as scientific. In other words, a method which starts from particulars must, in order to be scientific, be largely inductive. But in theology, as in all other departments of knowledge, the only induction which is of any value is more than any mere summation or combination of facts. The so-called methods of induction—the methods of agreement, of difference, and of concomitant variations — are as applicable in theology as in physical or mental science. They are not, properly speaking, processes of induction; they are merely rules for testing inductions. Their value, of course, is not thereby lessened.

The theologian, not less than the physicist, must be on his guard against fancying that the validity or certainty of his inductions is to be estimated by the number of his instances. Many who have undertaken to prove the Divine existence by the cosmological and teleological arguments have made the fatal mistake of supposing that all that was needed was an accumulation of what they deemed examples or illustrations of Divine wisdom. They have overlooked that what is, above all, necessary to show the truth of the principles of causality and finality, and the legitimacy of those applications of them, which are involved in the cosmological and teleological arguments. They have spent their strength on what is easy, superficial, and indecisive, and had none left to deal with what is difficult, deep, and of vital moment. They have failed to apprehend that the essential question at issue is not, What or how many appearances of order and of adaptation may be traced in the various provinces of nature? but, Do such appearances *in any case* warrant an inference to a supernatural intelligence and purpose? In like manner many dogmatic theologians have seemed to think that in order to establish a doctrine it was enough to cite a number of texts in its favor. Often their doctrines would be more easily believed if their texts were fewer. In some departments of theology the laws to be discovered are laws of evolution, while in others they are laws of existence. Hence the method to be followed in the former must be predominantly chronological and genetic, in the latter predominantly analytic and synthetic.

The two methods of induction to which reference has just been made—the historical and the thetical—are to be carefully distinguished but not absolutely separated, and still less exhibited as antagonistic. Both have specific and appropriate functions; neither is exclusively legitimate or can alone accomplish the work of science. In the sphere of religion, as in every other sphere, to confound history with science is to eliminate and destroy science; but in no sphere is knowledge of history more a condition of the attainment of science, and historical research, properly conducted, more serviceable to scientific investigation, than in that of religion. To the historical method we owe, not only the historical disciplines of theology, but also in a considerable measure the recent progress of its positive or theoretical disciplines. It can never, however, be, as some fanatical disciples of the historical school would have us to suppose, the method of these last.

The inductions of theology, even in its systematic or non-historical departments, often require to be very careful and comprehensive in order to be conclusive. Theories or doctrines, like the Christian dogmas of the Trinity, incarnation, and atonement, were only arrived at through the labors and controversies of many generations of theologians. It could not be otherwise. These dogmas, simple as they may seem to a superficial glance and untrained eye, are in reality very complex organisms of thought, only capable of being formed by a long process of evolution. They are theories inclusive of many theorems. They comprehend a number of directly constitutive propositions and a still greater number of propositions subordinate and subsidiary to these. Every proposition which they involve should be the expression of real and relevant facts. As wholes they ought to combine a multitude of particulars of different kinds, and even of kinds the harmony of which is far from obvious and needs confirmation.

The inductions of theology, like those of other sciences, are seldom or never mere or pure inductions. They would be useless if they were. The example of pure induction given in treatises on logic may serve their purpose, the illustration of the nature of ratiocination, but they are not reasonings of a kind which can increase positive knowledge. The abstraction of induction from deduction may be needed to exhibit its distinctive formal character, but it is fatal to its practical efficiency. In all reasoning meant to increase our knowledge of objects, induction must receive from deduction some measure of assistance and guidance. This certainly holds true in theology. In regard to the doctrine of the Trinity, for example, the most difficult questions involved turn largely on the signification and application of the terms employed in its expression. These terms must be somehow defined, and definitions once introduced cannot fail to be used to some extent as principles of deduction.

Scientific method has not only to ascertain the facts and data of science, and to discover its laws, but also to distribute and coördinate its contents. And this last is likewise an important function. Science is system. To exclude system from science is to suppress and destroy science. The spirit of system is in itself nothing more than the spirit of order and unity. Without unity and order—that is, without system—there is no science; instead of it there can be only confused ideas, isolated opinions. It is absurd to condemn either system or the spirit of system in theology or any other science. To systematize is an intellectual necessity; to systematize aright is a happy achievement and an immense boon; it is merely systematizing erroneously which is evil. Theology, by professing to be a science, pledges itself to systematize in a scientific manner. By claiming to be the science of religion it undertakes to exhibit the truths of religion in their proper relationship to one another, in their organic unity and essential interdependence. Thus to proceed is necessary to it, not only as a consequence, but also as a means of the development of its constituent dogmas, for no doctrine can be truly and fully evolved in isolation, but only in connection with kindred doctrines and through the general growth of the science or system to which it belongs.

Unfortunately it cannot be denied that there has been a vast amount of erroneous systematizing in theology, and that it has done a vast amount of harm. Doubtless much of the aversion felt and expressed to system in theology is to be traced to the imperfect, artificial, false character of many theological systems. Instead of exhibiting religious truths in their real significance and interdependence, theological systems have often disguised and disfigured, cramped and contorted these truths, or even ignored and rejected them. How, then, is a true and appropriate system to be distinguished from one which is false and imperfect? In various respects, which can here be merely mentioned.

Thus, first, a true system is natural and not artificial. In equivalent terms, it is directly derived from the character of the matter of which it treats, and not arbitrarily imposed on that matter from without. Every system of thought, whether true or false, must, of course, be the product of intellect, but no true system is a mere invention of intellect, a mere subjective creation interposed between the mind and things; it is, on the contrary, a representation of the real natures and relations of things. The human intellect can only construct a true system by finding in and among facts the connections and harmonies which are actually there. But to do this may require more labor than is agreeable, or may contravene some cherished prejudice, or may not be recognized to be the sole legitimate procedure, and so it may devise, instead, a formula or scheme of thought suggested by some idea drawn from an extraneous source, force that scheme or formula upon things to which it is inappropriate, and so construct a system which is artificial and erroneous. Most sciences have suffered from artificial systemization of this kind, but probably none nearly so much as theology.

Secondly, in a true system of theology the material and formal constituents of knowledge will be duly combined, but not in a false system. No true system of theology can be constructed simply by logical deduction from abstract conceptions, from *a priori* assumptions, from self-evident axioms. Mere reasoning from data so insufficient as these may be made plausible and imposing by being thrown into syllogistic, dialectic, or mathematical shapes, but it cannot be made truly profitable and productive. Reason can only work effectively in theology when it is in possession of a large and close acquaintance with Divine things and acts harmoniously with the whole spiritual nature. On the other hand, without the application of logical reflection to the truth implicitly contained in the sources of religious knowledge, without the help of definition, induction, deduction, and all the processes involved in analysis, generalization, judgment, and reasoning, we never could reach a scientific system at all.

Thirdly, a true system is one in which unity is the result of the conciliation of all relevant principles, even although they may be apparently antagonistic, while a false system is one which bases itself on some particular principle or idea to the exclusion of others, also legitimate. In a true system unity is produced by harmonizing differences; in a false system it is produced by ignoring differences. A true system of theology is one which grows out of the struggle of opposing elements and recognizes the validity and significance of all religious truth.

Fourthly, in a true system all the members are not merely included, connected, and classified—they are also unified through reference to a center. A true system must be a unity of members pervaded by a common life. In its remotest members must be traceable the pulsations of its heart. Only of late have theologians begun clearly to recognize that this characteristic of a true organic system must be taken into account in the formation of their science. Long after they were fully alive to the importance of treating of each head of doctrine or article of faith, each separate theological locus, they felt hardly any interest as to how the various doctrines, articles, or loci were to be connected. They were often content to take the order of arrangement from some external source, some creed, confession, or catechism. It was a step in advance when, although still arranging the dogmas merely in a series, they endeavored to give each dogma its place, on the ground of its natural and intrinsic relationship to other dogmas. The spirit of order and of system cannot rest, however, in the series. It must classify as well as connect the doctrines. This also may be accomplished in various ways, and even when there is general agreement as to what are the natural groups, there may be considerable difference of opinion as to their delimitation. But the most perfect distribution by classification, if unsupplemented, must be unsatisfactory. A still higher kind of unity has to be attained. It is that of the only unity which is truly organic. It is that of coördination and correlation through a single central principle. An intellectual system, a system of science or doctrine, can only have this unity, and be in consequence a true system, when all its particular truths and various departments or divisions of truth are connected with one another and combined into a whole by reference to a common and central truth. The necessity of conforming to this condition of systematizing has now begun to be felt among theologians, and hence in several modern systems of Christian dogmatics the doctrines are not merely distributed into groups, but an attempt is also made to find a center for the whole system in a single pervasive idea.

Must the work of method in theology end, however, even with the formation of a system which answers to the requirements just indicated? Is there no still higher procedure or application of theological method legitimate? This is to ask if there be any place for a speculative method in theology, and if speculative theology rest on any solid basis.

The history of theology might, perhaps, suffice of itself to show, on the one hand, that speculation has a large and legitimate place in the sphere of theology, and, on the other hand, that its place is one the limits of which are difficult to fix or keep within. Christian theology was initiated by Gnostic speculation, grandly reasonable in aiming at the exhibition of Christianty as the absolute truth and absolute religion, but otherwise wildly extravagant. An Origen and an Augustine owed largely to speculativeness both their successes and their failures. The defects of scholasticism were due more to misdirection of the reflective understanding than of the speculative reason, and it was especially the speculative and the mystic divines of the Middle Age who opened up the way to modern thought and modern theology. Men like Nicholas of Cusa, Bruno, Telesio, and Campanella, looking from the heights of speculation, saw some aspects of religious truth which the Reformers, standing on lower if safer and less cloudy ground, overlooked. A Descartes and a Spinoza, into whatever errors they may have fallen, certainly did much, and in a directly speculative manner, to enlarge and advance the philosophy of religion. Kant supposed that, by his critical researches into the nature and limits of knowledge, he had made an end of speculative theology and done what would effectually deter reason from speculative adventures. It soon became apparent that his expectations had been doomed to disappointment, that in reality he had excited speculative reason to extraordinary activity and even audacity, and inaugurated an era of theology far more speculative than any which had preceded it. The great speculative movement in philosophy headed by Fichte, Schelling, Hegel, Baader, Krause, and others passed on immediately into the sphere of theology, its leaders themselves proceeding to apply their principles and methods to the explanation of the doctrines and phases of religion. In America Hickok, Bushnell, and Mulford may be named as having shown confidence in the competency of speculative reason in the spiritual sphere. In Britain Principal Caird has argued in favor of a speculative procedure in theology with rare skill in his *Introduction to the Philosophy of Religion*. On the whole, however, both in America and Britain, the speculative method has received little recognition from theologians. But this, of course, may be held to be partly cause and partly effect of the want of life and originality of thoroughness and truthfulness, of ordinary American and British systematic theology.

Is there, then, room and need in theology for the speculative method? The answer must depend on what is meant by speculative method. There are kinds of so-called speculation which are plainly illegitimate and inapplicable. Thus, some have represented speculative theology as part of a philosophy of which the whole system is deduced in a purely and strictly logical manner from an *a priori* principle, idea, or datum. On this view the speculative thinker somehow apprehends an absolute first of thought or being, or both, and then from this primary and necessary datum evolves syllogistically or dialectically a whole philosophy, which includes a whole theology. Such speculation may be safely pronounced futile and delusive. It can never reasonably vindicate its choice of a starting-point, for the absolute first of existence and thought can only be that to which the worlds of fact and experience, of matter and of mind, refer us as their ultimate explanation. It ascribes an extravagant power to mere formal thinking. It is only consistent with exclusive idealism and exclusive rationalism, both justly discredited species of philosophy. It makes theology wholly dependent on a philosophy which must be false, since pure reason cannot, as it assumes, spin out of its own essence or out of any single datum the whole system of truth.

There is, however, a theology which claims to be at once speculative and independent of philosophy. Such was the theology which Rothe sought to elaborate in his *Theological Ethics*. In the "introduction" to that work he has fully explained his method. It is, as there represented, the very same method with that of speculative philosophy, but it starts from a different point—not from pure self-consciousness, but from the religious self-consciousness or God-consciousness. Its primary datum is, according to Rothe, as immediately certain as that of speculative philosophy, the pious man being just as directly sure of God as the natural man is of his own self. Out of this datum it must evolve all its conclusions by an inward logical necessity, and construct an entire theological system of such a nature that every single thought implicitly supposes the whole. Speculative theology thus conceived of needs but a single fact, the datum from which it starts, and that fact must be a self-evident one, given immediately in and by consciousness; all the rest is a succession of inferences deductively obtained. The facts of religion presented in nature, history, and Scripture not only need not but ought not to be taken into account by it, although at the close of its labors its success must be tested by the conformity or non-conformity of its results with those facts.

Still another species of theological speculation, however, has been attempted and commended—one which seems more modest, and claims to be more distinctively Christian. It is the method advocated and exemplified in the *Schriftbeweis* of Von Hofmann. He, instead of starting like Rothe with the religious consciousness, chose to start from a real concrete fact, what he calls the Christianity of the Christian—a Christianity which he supposes to have acquired in the Christian a separate standing of its own, in virtue of which, and independently even of Scripture, it is self-evident certain truth sustained and authenticated by the Spirit of God. From this fact or experience, expressed in its simplest and most general form, as a personal relationship or fellowship between God and man through Jesus Christ, Hofmann would deduce the whole theological system by a process of "thinking within" the central fact, so as logically to evolve from it its manifold wealth of contents, and would refrain on principle from looking outward, and taking into account the religious facts presented by history, experience, or Scripture. Doctor Hofmann himself was quite unable to carry out the method he contended for. His so-called speculative arguments are mere semblances of what they profess to be. Instead of the contents of his system being really "derived" from the simplest expression of the fact of Christianity, new propositions are constantly borrowed from the known contents of Christianity, and added from without to the simplest expression, in order to help out the unfolding of the system. Further, in Hofmann's system of speculation, as in that of Rothe, we are asked to start from an assumption which is not, and cannot be, justified—the assumption that Christianity in the Christian is independent of its objective grounds. Surely every experience may reasonably be called upon to produce evidence of its legitimacy and validity; and if so called upon, how can it avoid referring to its grounds? It is only by an examination of the grounds of an experience that we can know whether it is an experience of reality or a form or effect of illusion. The fact from which we are told by Hofmann that we must deduce all other facts is only itself intelligible in the light of many of these facts, and even of the Christian system as a whole; it is a fact which has many conditions, and the right understanding of it requires its being viewed under its various conditions, not as abstracted from and independent of them.

In the forms indicated, then, speculation has failed to make good its claim to participate in the formation and development of theology. Does it follow that its claim is wholly unfounded? By no means. Speculation in the forms described pretends to an independence of reality and a creative power for which there is no warrant in reason or confirmation in fact. Hence the futility of such speculation is no disproof of the utility of a speculation which will fully recognize reality and directly endeavor to elucidate it. Speculation of this latter kind seems to be a necessary condition of true systemization and a necessary supplement to induction and to all the special methods of particular sciences. In a true philosophy, for instance, science and speculation must necessarily be combined. So far from claiming independence of the sciences, a true philosophy will base itself upon them, and seek to rise above them by means of them. It is only thus that it can hope to reach the ultimate universal and real principle of knowledge and being, without which there can be no rest for reason or unity in the universe. But, having ascended by an analytic and inductive course to the unity of an all-comprehensive ultimate principle, philosophy must endeavor to descend from it in a synthetic and deductive manner, so as to exhibit the whole organism of existence or to determine how the many laws of science and the many facts of experience are connected with the absolute in being and causation, and through it with one another.

Nor can positive theology dispense with speculation. The theologian who is in earnest with the idea of God, who would find order and light in the idea, who would think of Him as He is, Absolute Being, Harmonious Life, Infinite Personality, Perfect Spirit, Ultimate and only Complete Explanation of the Universe, must assuredly speculate, and speculate freely and largely, although he ought also to do so humbly and reverently. Even if he would maintain that we cannot have a knowledge of God as He is—that we must renounce the hope of a speculative knowledge of Him, and be content with a merely regulative knowledge—he will find that he needs, as Kant, Hamilton, Mansel, and Spencer have practically so fully acknowledged, speculation, and much speculation, to support his thesis. The mind is not necessarily relieved from the duty of exercising speculative thought on the nature of God by receiving a special revelation regarding God. Christianity is a proof that such revelation may only increase obligation in this respect. It brought with it a wondrous idea of God, one of marvelous practical efficacy, but one also which forced Christian reason into paths of speculation, which could only be formulated after lengthened and severe speculative labor, and which no intellectually or spiritually quickened soul can accept otherwise than with speculative exertion.

And this may show that speculation is as legitimate and applicable within the sphere of Christianity as within that of general theology.

Theology is a unity, a whole, but a very complex unity, a whole of many dissimilar parts. It may be spoken of in a broad and general way as a science, but not less correctly as a department of sciences. It includes many studies or disciplines which may be cultivated in a scientific spirit and according to scientific methods, and these studies or disciplines, while closely connected, are also clearly distinct. They are by no means mere divisions of a special science. Natural theology and Christian dogmatics are as distinct from each other as physics is from chemistry or anatomy from physiology. Comparative theology and Biblical theology are as distinct from each other as the study of the general history of mankind is from the study of the history of England.

Hence arise a number of problems. How are the theological sciences related to the non-theological sciences and to one another? How are they located in the vast organism of science as a whole? and how are they connected with one another so as to form a smaller organic whole in themselves? What principles have they in common, and what tasks are proper to each? Wherein do they agree and wherein do they differ in their methods of research? These are very important questions. There cannot be an earnest and scientific study of theology where they are overlooked. It is the special task of the theological discipline called "encyclopædia of theology" to discuss and answer them—or, in other words, to determine the boundaries of theology, to exhibit and explain its inner organization, to indicate its component parts, and to trace their relations both to one another and to the theological system as a whole. This discipline is, therefore, the appropriate scientific approach and introduction to theology and to the various theological sciences.

Theological encyclopædia has had its course determined by the general movement of theology. The various theological disciplines required to be evolved before they could be coördinated. The designation "theological encyclopædia" first occurs in its current technical sense in Mursinna's *Primæ Lineæ Encyclopædiæ Theologicæ* (1764). It was only with the publication of Schleiermacher's *Kurze Darstellung des theologischen Studiums* in 1811 that the full scientific importance of the discipline was made evident. It has since been diligently cultivated in Germany, and is at length finding recognition in other countries.

There is an all-comprehensive science of religion—one which treats of religion in its unity and entirety. It alone completely answers to the idea and definition of theology. It is the one general theological science, comprehends and dominates the special theological sciences, so as to be the science of these sciences, and hence, in accordance with the true distinction between philosophy and science, is properly called philosophy rather than science—the philosophy of religion. All philosophy is science, but all science is not philosophy. Philosophy, as distinguished from science, is general or universal as distinguished from particular or special science. This distinction is, of course, not an absolute one, but of degree—of more or less; every other distinction between them, however, is positively erroneous. The one general theological science is appropriately, therefore, termed philosophy. It is the philosophy of religion as there is a philosophy of nature and a philosophy of mind, each inclusive of various sciences. It is of the very nature of philosophy to be both before and after the sciences to which it relates—to be at once their root and result, and at the same time their bond of union and source of life. And the general theology which may justly be identified with philosophy of religion has undoubtedly held this relation to the special theological sciences. It preceded them, being the germ from which they evolved, the root from which they have sprung; it has grown up along with them, permeating them as their common life; and it also succeeds and transcends them, basing itself on them and perfecting itself by means of them. It is the one generic science of the object with which it deals, and vast enough to comprehend a whole group of sciences, because its object—religion—is so rich, complex, and varied.

The primary task of a philosophy of religion is to ascertain and exhibit the nature of religion. Now, a general theory of religion is the natural introduction to all special religious studies and theological sciences, and yet can itself only be brought to perfection through the advancement of these studies and sciences. For example, we can only adequately understand the nature of religion through study of the history of religion, and yet we cannot trace the history of religion at all unless we know generally what religion is. Again, in such works on Christian dogmatics as those of Schenkel, Kahnis, Biedermann, and Lipsius, we find a considerable place assigned to an investigation into the general nature of religion. The investigation is manifestly not there strictly appropriate; its true position can only be in another and wider science. At the same time, it is undoubtedly a necessary antecedent to the investigations of Christian dogmatics, from the very fact that Christianity is a religion. On the other hand, Christianity is not only a religion, but a religion which claims to be the perfect or absolute religion; and, clearly, if the claim be well founded, the complete nature of religion can only be understood through that full knowledge of Christianity which Christian science may be expected to give.

The history of the philosophy of religion has, of course, been closely conjoined with the histories both of theology and of philosophy, and influenced by all the causes which have affected them. In the wide sense of religious reflection it is as old as either philosophy or theology. As a distinct department of philosophy, and the highest and most comprehensive theological science, it is of comparatively recent origin, and, indeed, younger than many a living individual; but even in this latter sense the whole histories both of philosophy and of theology have been needed as the preparation and foundation for it. It could only appear in its alone adequate form when both philosophy and theology were highly developed, when both had freed themselves from the yoke of all authority save that of truth and reason, when both had discovered their appropriate methods, when they could so combine as to do no violence to the proper nature of either—a kind of combination most difficult to accomplish. But this, as might easily be shown, was not before philosophy and theology became at once critical and speculative, or, in other words before that great revolution of thought with which the names of Kant, Hegel, and Schleiermacher are so gloriously associated. Only in the present century have philosophy and theology reached the stage in which they can unite and produce a philosophy of religion.

We now pass to special theological disciplines which can at the utmost merely become sciences as distinguished from philosophy. They all deal with religion, each of them treating of some particular portion or aspect of it; and the order and mode in which they do so determine their relations to one another and the order of their succession. If we would rise, for example, through study of the parts or phases of religion in a sure and natural manner to a knowledge of it as a whole, we must necessarily begin with what of it is nearest and most accessible to us. But what is so is its history. In its historical manifestation it is a phenomenon which no one can refuse to acknowledge. The history itself, however, is not only a most extensive but a very complex phenomenon. It is external and internal, corporeal and spiritual, a history of outward events and actions, institutions and rites, and also of ideas, convictions, and affections. What is external is nearer and more accessible to us than what is internal, and it is through the former that we must penetrate into the latter. They cannot be quite separated, for the external is only intelligible through the internal, and the internal only attainable and verifiable through the external; but they can be so far differentiated, and there is a history mainly of what is external in religion and another mainly of what is internal. The ordinary history of religion is mainly concerned with tracing the growth of religion in its most apparent form and institutional character. It may be divided into three great sections—the ethnic, Biblical, and ecclesiastical—the history of the heathen religions, the history of the Jewish religion and of the rise of Christianity, and the history of the Christian church. Whether history in this form, even when studied in the most accurate and thorough manner, should be called science may be doubted, as it is simply occupied with the discovery and description of the particular and concrete. It is not usual so to designate it in any of its sections. The history of religious beliefs and ideas may be as purely and properly history as that of external institutions and transactions. It deals, however, not only with what is internal and spiritual but also with what is abstract and general, and hence it is at least more akin to science than is common history, and its sections are often called sciences. These sections are three in number and correspond to the sections of the ordinary history. They are known as comparative theology, Biblical theology, and the history of Christian doctrine. To the last of these, symbolics may fairly claim to be a necessary supplement. They are quite distinct from a conceivably attainable knowledge of the laws of religious history, such as might be with strict propriety designated science of religious history, a department of science of history. Of historical science in this last sense there is as yet extremely little.

Religion is a spiritual process, and its history continuously implies the affections and operations of mind. The historical treatment of religion, therefore, necessarily leads to its psychological treatment. The history alike of religious events and actions and of religious ideas and beliefs can only be explained through a knowledge of the religious powers and processes, *i.e.*, of the psychological factors and states which condition and determine its development. The psychological study of religion, although it has been greatly neglected, should reach over a very large department of theology. The department may be distributed into three disciplines—the general, comparative and special psychology of religion. The first should treat of the general religious nature of man; the second should discover and compare the psychical peculiarities to be found in the various religions; and the third should exhibit elaborately the psychology of a particular religion as *e.g.*, Biblical and Christian psychology.

The historical and psychological sciences of religion deal with religion merely as an historical and psychological phenomenon. They do not imply its truth, and can be cultivated by those who regard it as a delusion equally with those who acknowledge it to be a certainty. It is the office of apologetics to determine whether or not it is true and how far it is true. If it end not in a negative result, in agnosticism or atheism, it must prove that God reveals himself to man, and that man apprehends God. In other words, apologetics treats of the media of revelation—alike the objective and subjective, divine and human media—and so is the science on the one hand, of revelation, and, on the other hand, of religious certitude.

The highest stage of theological science is the methodical education and exhibition of the truth involved in religion, either as contents of faith or elements of life. When conversant with the faith it is dogmatics, when with the life ethics; but, of course, here again distinction is not to be confounded with separation. True faith is living faith, and true life is the life of faith. Dogmatics and ethics are so intimately related that it is not surprising that they should have been long left undifferentiated, or that a few eminent theologians should still deny that they can be properly treated apart. Theology at this stage is commonly designated systematic, although the term is not a good one, and others, little if any better perhaps, as didactic, theoretical, positive, thetic, etc., have been suggested as substitutes. Systematic theology, like historical, psychological, and apologetic theology, is divisible into general and special, the former including natural theology and theological ethics, and the latter Christian dogmatics and Christian ethics.

The historical and psychological sciences of religion may be conjoined under the designation of empirical, or phenomenological, or historical (in the widest sense); the apologetic and systematic sciences under that of didactic, thetic, speculative, or systematic (in a loose sense). This twofold division of them is the one generally adopted. And as it rests on an obvious and important distinction it is fully entitled to acceptance, provided it be so received as not to hide or extrude the fourfold division founded on the real moments or stages of the process of theological investigation.

There are a considerable number of disciplines not included in the divisions indicated, yet for which the theological encyclopædist is bound to find appropriate places. The best classification of these is into exegetical and practical. So-called exegetical theology, however, is in all its departments simply instrumental and introductory to historical theology; and practical theology is in all its departments concerned with the use and application of religious knowledge, not with its acquisition and advancement. The former is not directly occupied with religion, but with the records and documents from which its history must be ascertained; the latter is art and not science.

Considering theology, then, only as science directly engaged on religion, the following are the sciences which belong to general theology:—(1) the history of religions; (2) comparative theology; (3) psychology of religion; (4) theological apologetics; (5) natural theology; and (6) theological ethics. Those of Christian theology are—(1) Biblical history; (2) ecclesiastical history; (3) Biblical theology; (4) history of Christian doctrine; (5) symbolics; (6) Biblical and Christian psychology; (7) Christian apologetics; (8) Christian dogmatics; and (9) Christian ethics.

THEOPHILUS. Nicholas Alemanni, in his notes to the first edition of the *Anecdota* of Procopius (see PROCOPIUS), published in 1623, repeatedly quotes a life of Justinian, which he attributes to "Theophilus Abbas, præceptor Justiniani," but without telling us where he found this Life or who Theophilus was. Subsequent writers have continued to quote Theophilus from Alemanni's notes for the facts ascribed to him in those notes, and among others, for the name Upravda, said to have been the original name of Justinian, and other proper names of members of the family of that emperor. Mr. Bryce has discovered in the Barberini library at Rome what appears to be the MS. of the so-called Life of Justinian used by Alemanni. It is in Latin, and purports to be an extract made by Ivan Tomco Marnavich, a Croatian ecclesiastic (1573–1639), from a Life of Justinian by a certain Bogomil (Græce *Theophilus*), who is alleged to have been the instructor of Justinian, and abbot of St. Alexander at Prisrend (in Macedonia), and afterward Bishop of Sardica (now Sofia, in Bulgaria), the original of which Life, in Slavonic, is stated in the Barberini MS. to exist in the Slavonic monastery of Basilian monks on Mount Athos. No such Slavonic MS. (so far as is known) has ever been discovered in Athos or elsewhere; no Slavonic MS. of the age of Justinian could possibly exist; and the contents of the Latin extract preserved at Rome are of so legendary a character as to throw the greatest doubt on the facts cited from Theophilus by Alemanni, including the name Upravda above referred to, and the Slavonic origin of Justinian. It seems doubtful whether this Theophilus Abbas, whom the Roman MS. identifies with a certain Domnio, bishop of Sardica in 517 (see Marcellinus Comes, *Chronicon*, ad ann. 517), ever existed at all.

THEOPHRASTUS, the successor of Aristotle in the Peripatetic school, was a native of Eresus, in Lesbos. The date of his birth is a matter of inference, and has been fixed betwen 373 and 368 B.C. It is said that his original name was Tyrtamus, and that the name Theophrastus was given him by Aristotle on account of his eloquence, but this story is quite as likely to be an afterthought suggested by the name at a later date. Theophrastus presided over the Peripatetic school for thirty-five years, and died in 288 B.C. Under his guidance the school flourished greatly in point of numbers, and at his death he bequeathed to it his garden, with house and colonnades, as a permanent seat of instruction.

THEOPHYLACT, a well-known Biblical commentator, was born most probably at Euripus, in Eubœa, about the middle of the eleventh century. He became a deacon at Constantinople, and attained a high reputation as a scholar, as is shown by the fact that he became the tutor of Constantine Porphyrogenitus, son of Michael VII., for whom he wrote his *Παιδεία βασιλική*. His death took place after 1107.

THEOPHYLACT of Simocatta. See BYZANTINE HISTORIANS.

THEOPOMPUS of Chios, a celebrated Greek historian and rhetorician, was born about 378 B.C. In early youth he seems to have spent some time at Athens, along with his father, who had been exiled on account of his Laconian sympathies. Here he became a pupil of Isocrates, and rapidly made great progress in rhetoric. At first he appears to have composed epideictic speeches, in which he attained to such proficiency that in 352–351 he gained the prize of oratory given by Artemisia in honor of her husband, although Isocrates was himself among the competitors. It is said to have been the advice of his teacher that finally determined his career as an historian. Through the influence of Alexander he was restored to Chios about 333, and figured for some time as one of the boldest and most uncompromising leaders of the aristocratical party in his native town. After Alexander's death he was again expelled, and took refuge with Ptolemy in Egypt, where he appears to have met with a somewhat cold reception. The date of his death is unknown.

THEORBO. See LUTE.

THEORY may be defined as opposed to fact, to hypothesis, or to practice. The formulation of a theory signifies that a series of facts have been generalized from, and are presented in a single statement. It may also be said that a theory corresponds generally to a principle or truth, or to a law. To give the theory of the fact in this sense is to give its general law or explanation, or, in other words, its cause. Newton's early view in regard to gravitation might properly be defined as an hypothesis. When he had fully worked out the problem he announced it as a law. In medicine theory is opposed to practice. Practice is empirical, based upon experience, and embodying the results of knowledge thus obtained. Theory is the formulation of a general law. It is therefore necessary to exercise caution in employing theoretical knowledge either in art or science, or in the common affairs of everyday life. It is not enough that the theories are fully established; we must also consider the conditions of every case, so as to allow for the practical operation of every agent involved.

THEOSOPHY, as its derivation implies, is a term used to denote those forms of philosophic and religious thought which claim a special insight into the Divine nature and its constitutive moments or processes. Sometimes this insight is claimed as the result of the operation of some higher faculty or some supernatural revelation to the individual; in other instances the theosophical theory is not based upon any special illumination, but is simply put forward as the deepest speculative wisdom of its author. But in any case it is characteristic of theosophy that it starts with an explication of the Divine essence, and endeavors to deduce the phenomenal universe from the play of forces within the Divine nature itself.

The name with which it is oftenest coupled is mysticism (See MYSTICISM). The latter term has properly a practical, rather than a speculative reference; but it is currently applied so as to include the systems of thought on which practical mysticism was based. Thus, to take only one prominent example, the profound speculations of Meister ECKHART (*q.v.*) are always treated under the head of Mysticism, but they might with equal right appear under the rubric Theosophy. In other words, while an emotional and practical mysticism may exist without attempting philosophically to explain itself, speculative mysticism is almost another name for theosophy. There is still a certain difference observable, however, in so far as the speculative mystic remains primarily concerned with the theory of the soul's relation to God, while the theosophist gives his thoughts a wider scope, and frequently devotes himself to the elaboration of a fantastic philosophy of nature.

In the above acceptation of the term, the Neoplatonic doctrine of emanations from the supra-essential One, the fanciful emanation-doctrine of some of the Gnostics (the æons of the Valentinian system might be mentioned), and the elaborate esoteric system of the Kabbalah, to which the two former in all probability largely contributed are generally included under the head of theosophy. In the two latter instances there may be noted the allegorical interpretation of traditional doctrines and sacred writings which is a common characteristic of theosophical writers. Still more typical examples of theosophy are furnished by the mystical system of Meister Eckhart and the doctrine of Jacob BOEHME (*q.v.*) who is known as "the theosophist" *par excellence.*

THERA, or, as it is now called, SANTORIN, is a volcanic island in the Ægean Sea, the southernmost of the group of islands, called Sporades, which intervene between the Cyclades and Crete. From the last-named island it is separated by a space of sixty miles of sea. On the west lies the smaller isle of Therasia.

Santorin and Therasia have been recently the scene of a remarkable archæological discovery. In the southern parts of both those islands prehistoric dwell ings have been found at some height above the sea, and there is no reasonable cause to doubt that these date from a period antecedent to the falling in of the crater and the formation of the bay. This is proved by their position underneath the layer of tufa which covers the islands, and, moreover, by these layers of tufa being broken off precipitously, in the same way as the lava-rocks, a fact which can only be explained by the supposition that they all fell in together. The foundations of the dwellings rested, not on the tufa, but on the lava below it; and here and there between the stones branches of wild olive were found, according to a mode of building that still prevails in the island, in order to resist the shocks of earthquakes. Part of the skeleton of a man was discovered, and large vases, some containing grain, others stone instruments very carefully worked. Some of these vases were of fine yellowish earth, ornamented with brown bands; some, of smaller size, were more elaborately decorated, sometimes with lines representing foliage, and in a few instances with figures of animals; some were of red earth, without ornament; while others, of pale red earth, were of very large dimensions. No implements of metal were found. Naturally it has been the subject of much discussion what was the origin of this very primitive art.

THERAMENES, an Athenian who played a prominent part in the history of Athens toward the close of the Peloponnesian War and in the revolution which followed it. He was one of the conspirators who, in 411 B.C., abolished the democracy at Athens, and substituted the oligarchy of the Four Hundred. In 410 Theramenes commanded one of the three squadrons of the Athenian fleet in the victory over the Spartans at Cyzicus. In 409 he took part in the siege of Chalcedon and the capture of Byzantium. At the battle of Arginusæ in 406 he was one of the officers deputed by the generals in command to pick up the crews of the disabled ships; but the rescue was not effected, on account, it seems, of the storm. Nevertheless, on his return to Athens, Theramenes took a leading part in accusing and procuring the condemnation to death of the generals for neglecting to rescue the men. When Athens was besieged by the Peloponnesians, Theramenes conducted the negotiations for surrendering the city, traitorously prolonging them till starvation compelled the Athenians to accept the rigorous terms imposed by Sparta. After the surrender he formed one of the notorious Thirty who, backed by a Spartan garrison, misgoverned Athens. But by opposing their excesses he incurred their suspicions, and, being denounced by Critias, the most violent of the Thirty, he was, in defiance of the forms of law, put to death (404).

THERAPEUTÆ. See MONACHISM.

THERAPEUTICS, from a Greek word, signifying "I heal," is that division of the science of medicine which treats of the action of drugs or other remedies upon the diseased system, or the means which may be used to assist nature in restoring health.

THERESA, ST. Teresa de Cepeda, perhaps the favorite saint of modern Spain, was born at Avila, in Old Castile, on March 28, 1515. Teresa lost her mother early, and as she grew up her father deemed it best to send her to be educated in an Augustinian convent in the town, but without any thoughts of her adopting a religious life. She would probably have married like her sisters, had it not been for an attack of illness. She was sent away for change of air on a visit to one of her sisters, and on her way home spent some days with a saintly uncle, who was on the eve of entering a monastery, and who strongly urged her to withdraw from the world. Her father was greatly opposed to the step, but Teresa was not to be turned from what she conceived to be her duty. She was only eighteen when she left home one morning, and applied for admission at the Carmelite convent of the Incarnation. She was disappointed at first at the slackness of discipline. The sisters mixed freely in the society of Avila, receiving visits and returning them, and often absenting themselves from the cloister for months at a time. For the first three years she was constantly subject to attacks of sickness, fainting fits, and paroxysms of pain, but she prayed to St. Joseph, after which she became comparatively better, though her nervous system was completely shaken. But she appears afterward to have accommodated herself with tolerable success to the worldliness of her environment, though not without intervals of religious misgiving. It was in the year 1554 (her novitiate dated from 1534), when she was thus nearly forty, that the event known as her conversion took place, and the second part of her life began. The death of her father roused her to serious reflection, and one day, as she entered the oratory, she was struck by the image of the wounded Christ, placed there for an approaching festival. The blood was depicted as streaming over the face from the thorns and running from the side and the hands and feet. The spectacle of suffering pierced Teresa's breast; she fell in tears at the feet of the figure, and felt every worldly emotion die within her. The shock threw her into a trance, and these trances, accompanied by visions, recurred frequently in the subsequent part of her life.

Meanwhile, on the broad stage of the world, the Reformation continued to spread and establish itself; and this great falling away became the subject of much searching of hearts to pious Catholics. Teresa reflected like the rest, and her experience led her to find the real cause of the catastrophe in the relaxation of discipline within the religious orders. If the ancient rules could be restored, it appeared to her that the evil might be stemmed; and she formed the project of founding a house in which all the original rules of the Carmelite order before its relaxation would be observed. She met, not unnaturally, with great opposition from the authorities of the order, and in particular from the prioress and sisters of the Incarnation, who looked upon the step as a reflection upon themselves. Nevertheless, she persevered with her scheme, being encouraged to appeal to the pope by certain priests who saw the benefit which would accrue to the church from her zeal. A private house in Avila was secretly got ready to serve as a small convent, and, when the bull arrived from Rome, Teresa went out on leave from the Incarnation and installed four poor women in the new house dedicated to her patron St. Joseph. It was on August 24, 1562, that mass was said in the little chapel and the new order constituted. After lodging her four sisters, Teresa returned to the Incarnation, as in duty bound; but, when the secret was discovered, Carmelites and townspeople were alike furious. Violence, however, was prevented, and the matter was referred to the council of state at Madrid. Philip II. referred it again to the pope, and after six months a fresh bull arrived from Pius V. The provincial of her order now gave her leave to remove and take charge of her sisterhood. The number of thirteen, to which on grounds of discipline she had limited the foundation, was soon filled up, and Teresa spent here the five happiest years of her life. The general of the order visited her at Avila, and gave her powers to found other houses of Descalzos, for men as well as women.

Convents were founded at Medina, Malaga, Valladolid, Toledo, Segovia, and Salamanca, and two at Alva under the patronage of the famous duke. Then she had three years of rest, as prioress of her old convent of the Incarnation. She next went to Seville to found a house, thus overstepping for the first time the boundaries of the Castiles, to which her authorization limited her. The latent hostility of the old order was aroused; the general ordered the immediate suppression of the house at Seville, and procured a bull from Gregory XIII. prohibiting the further extension of the reformed houses (1575). But the movement against her came from Italy, and was resented by Philip and the Spanish authorities as undue interference; and, after a fierce struggle, during which Teresa was two years under arrest at Toledo, the Carmelites were divided into two bodies in 1580, and the Descalzos obtained the right to elect their own provincial-generals (see CARMELITES). The few remaining years of Teresa's life were spent in the old way, organizing the order she had founded, and traveling about to open new convents. Sixteen convents and fourteen monasteries were founded by her efforts; she wrote a history of her foundations, which forms a supplement to her autobiography. Her last journey of inspection was cut short at Alva, where she died on September 29, 1582.

THERESIOPEL, or THERESIENSTADT. See SZABADKA.

THERMAL SPRINGS. See GEOLOGY and MINERAL WATERS.

THERMODYNAMICS. In a strict interpretation, this branch of science, sometimes called the Dynamical Theory of Heat, deals with the relations between heat and work, though it is often extended so as to include all transformations of energy. Either term is an infelicitous one, for there is no direct reference to force in the majority of questions dealt with in the subject.

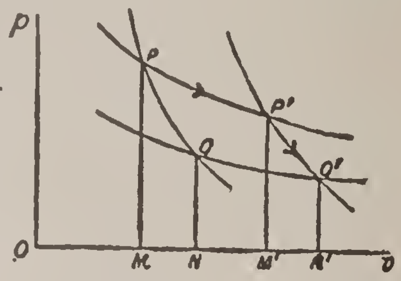
In giving a brief sketch of the science, we will not adhere strictly to any of the separate paths pursued by its founders, but will employ for each step what appears to be most easily intelligible to the general reader. And we will arrange the steps in such an order that the necessity for each may be distinctly visible before we take it.

General Notions.—The conversion of mechanical work into heat can always be effected completely. In fact, friction, without which even statical results would be all but unrealizable in practical life, interferes to a marked extent in almost every problem of kinetics—and work done against friction is (as a rule) converted into heat. But the conversion of heat into work can be effected only in part, usually in very small part. Thus heat is regarded as the lower or less useful of these forms of energy, and when part of it is elevated in rank by conversion into work the remainder sinks still lower in the scale of usefulness than before.

There are but two processes known to us for the conversion of heat into work, viz., that adopted in heat-engines, where the changes of volume of the "working substance" are employed, and that of electromagnetic engines driven by thermoelectric currents. For simplicity we will suppose the working substance to be fluid, so as to have the same pressure throughout, or, if it be solid, to be isotropic, and to be subject only to hydrostatic pressure, or to tension uniform in all directions and the same from point to point.

The state of unit mass of such a substance is known by experiment to be fully determined when its volume and pressure are given, even if (as in the case of ice in presence of water, or of water in presence of steam) part of it is in one molecular state and part in another. But, the state being determinate, so must be the temperature, and also the amount of energy which the substance contains. This consideration is insisted on by Carnot as the foundation of his investigations. In other words, before we are entitled to reason upon the relation between the heat supplied to and the work done by the working substance, Carnot says we must bring that substance, by means of a *cycle* of operations, back to precisely its primitive state as regards volume, temperature, and molecular condition.

Watt's Diagram.—Watt's indicator-diagram (see STEAM-ENGINE) enables us to represent our operations graphically. For if OM (fig. 1) represent the volume, at any instant, of the unit mass of working substance, MP its pressure, the point P is determinate and corresponds to a definite temperature, definite energy, etc. If the points of any curve, as PP′, in the diagram represent the successive states through which the working substance is made to pass, the work done is (*loc. cit.*) represented by the area MPP′M′. Hence, a cycle of operations, whose essential nature is to bring the working substance back to its primitive state, is necessarily represented by a *closed* boundary, such as PP′Q′Q, in the diagram. The area inclosed is the excess of the work done by the working substance over that spent on it during the cycle.



Carnot's Cycle.—For a reason which will immediately appear, Carnot limited the operations in his cycle to two kinds, employed alternately during the expansion and during the compression of the working substance. The first of these involves change of volume *at constant temperature;* the second, change of volume *without direct loss or gain of heat.* [In his hypothetical engine the substance was supposed to be in contact with a body kept at constant temperature, or to be entirely surrounded by non conducting materials.] The corresponding curves in the diagram are called *isothermals*, or lines of equal temperature, and *adiabatic* lines respectively. We may consider these as having been found, for any particular working substance, by the direct use of Watt's indicator. It is easy to see that one, and only one, of each of these kinds of lines can be found for an assigned initial state of the working substance; also that, because in expansion at constant temperature heat must be constantly supplied, the pressure will fall off less rapidly than in adiabatic expansion.

Carnot's Principle of Reversibility.—It will be observed that each operation of this cycle is strictly *reversible;* for instance, to take the working substance along the path P′P we should have to spend on it step by step as much work as it gave out in passing along PP′, and we should thus restore to the source of heat exactly the amount of heat which the working substance took from it during the expansion. In the case of the adiabatics the work spent during compression is the same as that done during the corresponding expansion, and there is no question of loss or gain of heat directly.

If, however, a transfer of heat between the working substance and its surroundings have taken place on account of a finite difference of temperature, it is clear that such an operation is not reversible. Strictly speaking, isothermal expansion or contraction is unattainable in practice, but it is (without limit) more closely approximated to as the operation is more slowly performed. The adiabatic condition, on the other hand, is more closely approximated to in practice the more swiftly the operation is performed. We have an excellent instance of this in the compression and dilatation of air caused by the propagation of a sound-wave.

And now we have Carnot's invaluable proposition, *a reversible heat-engine is a perfect engine*—perfect, that is, in the sense that no other heat-engine can be superior to it. Before giving the proof, let us see the immense consequences of this proposition. Reversibility is the sole test of perfection; so that all heat-engines, *whatever be the working substance*, provided only they be reversible, convert into work (under given circumstances) the same fraction of the heat supplied to them. The only circumstances involved are the temperatures of the source and condenser. Thus we are furnished with a general principle on which to reason about transformation of heat, altogether independently of the properties of any particular substance.

The proof, as Carnot gave it on the hypothesis of the materiality of heat, is *ex absurdo.* It is as follows: Suppose a heat-engine A to be capable of giving more work from a given amount of heat than is a reversible engine B, the temperatures of source and condenser being the same for each. Use the two as a compound engine, A working direct and B reversed. By hypothesis B requires to be furnished with part only of the work given by A to be able to restore to the source the heat abstracted by A, and thus at every complete stroke of the compound engine the source has its heat restored to it, while a certain amount of external work has been done. This would be the PERPETUAL MOTION, (*q.v.*)

The Basis of the Second Law of Thermodynamics.—Carnot's reasoning just given is based on the hypothesis that heat (or caloric) is indestructible, and that (under certain conditions) it does work in being let down from a higher to a lower temperature, just as does water when falling to a lower level. It is clear from several expressions in his work that Carnot was not at all satisfied with this view, even in 1824, and we have seen that he soon afterward reached the true theory. But it is also clear that such an assumption somewhat simplifies the reasoning, for in his hypothetical heat-engine all the heat which leaves the boiler goes to the condenser, and *vice versa* in the reversed working.

We have now to consider that, if an engine (whether simple or compound) does work at all by means of heat, *less* heat necessarily reaches the condenser than left the boiler. Hence, if there be two engines A and B as before, and the joint system be worked in such a way that B constantly restores to the source the heat taken from it by A, we can account for the excess of work done by A over that spent on B solely by supposing that B *takes more heat from the condenser than* A *gives to it.* Such a compound engine would transform into work heat taken solely from the condenser. And the work so obtained might be employed on B, so as to make it convey heat to the source while farther cooling the condenser.

The Laws of Thermodynamics.—I. When equal quantities of mechanical effect are produced by any means whatever from purely thermal sources, or lost in purely thermal effects, equal quantities of heat are put out of existence, or are generated.

II. If an engine be such that, when it is worked backward, the physical and mechanical agencies in every part of its motions are all reversed, it produces as much mechanical effect as can be produced by any thermodynamic engine, with the same temperatures of source and refrigerator, from a given quantity of heat.

Absolute Temperature.—We have seen that the fraction of the heat supplied to it which a reversible engine can convert into work depends *only* on the temperatures of the boiler and of the condenser. On this result of Carnot's Sir W. Thomson based his absolute definition of temperature. It is clear that a certain freedom of choice is left, and Thomson endeavored to preserve as close an agreement as possible between the new scale and that of the air thermometer. Thus the definition ultimately fixed on, after exhaustive experiments, runs: "The temperatures of two bodies are proportional to the quantities of heat, respectively, taken in and given out in localities at one temperature, and at the other, respectively, by a material system subjected to a complete cycle of perfectly reversible thermodynamic operations, and not allowed to part with or take in heat at any other temperature; or, the absolute values of two temperatures are to one another in the proportion of the heat taken in to the heat rejected in a perfect thermodynamic engine, working with a source and refrigerator at the higher and lower of the temperatures, respectively."

The Dissipation of Energy.—Sir William Thomson has introduced the term *thermodynamic motivity* to signify "the possession the waste of which is called dissipation." We speak of a distribution of heat in a body or system of bodies as having motivity, and we may regard it from without or from within the system.

In the first case it expresses the amount of work which can be obtained by means of perfect engines employed to reduce the whole system to some definite temperature, that, say, of the surrounding medium. In the second case the system is regarded as self-contained, its hotter parts acting as sources, and its colder parts as condensers for the perfect engine.

As an instance of internal motivity we may take the case of a system consisting of two equal portions of the same substance at different temperatures, say a pound of boiling water and a pound of ice-cold water. If we neglect the (small) change of specific heat with temperature, it is found that, when the internal motivity of the system is exhausted, the temperature is about 46° C., being the centigrade temperature corresponding to the geometrical mean of the original absolute temperatures of the parts. Had the parts been simply mixed so as to dissipate the internal motivity, the resulting temperature would have been 50° C. Thus the work gained (*i.e.*, the original internal motivity) is the equivalent of the heat which would raise two pounds of water from 46° C. to 50° C.

As an instance of motivity regarded from without we may take the simple case of the working substance in the diagram, on the hypothesis that there is an assigned lower temperature limit. As there is no supply of heat, it is clear that the maximum of work will be obtained by allowing the substance to expand adiabatically till its temperature sinks to the assigned limit.

THERMOELECTRICITY. See ELECTRICITY.

THERMOMETER, an instrument for detecting and measuring differences in temperature. The name is usually restricted to instruments adapted for use at moderate temperatures; those for measuring high temperatures are termed pyrometers (see PYROMETER).

History.—The honor of inventing the thermometer has been given to several natural philosophers of the sixteenth century; the claims of Robert Fludd are more tangible than those of Drebbel and Santorio, but the instrument invented by Galileo before 1597 seems best entitled to be considered the precursor of accurate thermometers. All the early instruments were air thermoscopes, and, until the variations of atmospheric pressure were discovered, their use was only deceptive. Galileo's thermometer consisted of a glass bulb containing air, terminating below in a long glass tube which dipped into a vessel containing a colored fluid. The variations of volume of the inclosed air caused the fluid to fall or rise in the tube, to which an arbitrary scale was attached. The great step in advance of inventing the alcohol thermometer is also due to Galileo, but the date (probably 1611 or 1612) is not precisely known. Rinieri certainly had alcohol thermometers made before 1647, and they are referred to as familiarly known in the oldest memoirs of the Accademia del Cimento (1667). In form they resembled those now in use; they had large spherical (or, occasionally, cylindrical or helical) bulbs, and the degrees intended to represent thousandths of the volume of the reservoir were marked with beads of enamel fused onto the stem.

The thermometer has remained unchanged in its main features since the middle of the eighteenth century. Mercury has been found the most convenient fluid for ordinary use, in spite of the advantages presented by lighter and more volatile liquids. Graduation of thermometers, by marking off volumes of the stem equal to a given fraction of the capacity of the bulb, although reintroduced by Réaumur in 1730, has now been entirely discontinued.

The idea of a self-registering thermometer early presented itself. Many forms were devised by natural philosophers and instrument-makers. That of Sixe, in 1782, a precursor of which, dating from the seventeenth century, is preserved among the instruments of the Florentine Academy, was the most successful.

Scales.—The absolute zero of temperature is the logical beginning of a thermometric scale, but some point easy of reference is desirable, and this is found in the temperature at which ice melts and water freezes. The second accepted fixed point is that at which distilled water boils under the pressure of 760 millimetres (29.92 in.) of mercury. For the division of the space between the two fixed points into degrees of convenient length only three of the innumerable methods proposed have survived, and one of these, the centigrade, is rapidly becoming universal. The oldest system, that of Fahrenheit, dates from 1724. It is used for meteorological purposes, and popularly, in Great Britian, the British colonies, and the United States. The freezing point is marked 32° and the boiling point of water 212°. At first Fahrenheit employed a scale of 180 degrees; the zero was placed at "temperate" (9° C.); 90° at "blood-heat," the point to which the alcohol rose when the thermometer was placed under the arm of a healthy man; and —90° at the temperature of a mixture of ice and salt, then believed to be the greatest possible cold. In 1714 Fahrenheit changed his scale at the suggestion of the Danish astronomer Roemer, placed 0° at his "absolute zero," and divided the space between that and the warmth of the human body into 24 degrees. The freezing point of water thus became 8°. For convenience, these long degrees were divided into quarters, which were afterward termed degrees; thus the freezing point became 32° and blood heat 96°. A mercury thermometer graduated in this way, with divisions of equal length continued above blood heat, registered 212° in boiling water. Thus the Fahrenheit scale came from a duodecimal reckoning.

De Lisle, in 1724, introduced a scale in which the boiling point of water was marked 0° and the temperature of the cellars of the Paris Observatory 100°. He afterward adopted the freezing point of water as his upper fixed point, and called it 1500. This scale was used for many years in Russia but is now obsolete.

In 1730 Réaumur made alcohol thermometers with their zero at the freezing point of water, and degrees of one thousandth of the volume of the bulb. On some of these the boiling point of water was 80°; but the instruments were defective in principle and very unequal in their indications. Deluc introduced mercury thermometers graduated from 0° in melting ice to 80° in boiling water, and these, with Réaumur's name attached, are in use for popular purposes in Germany, Holland, and other parts of the continent.

Celsius adopted a centesimal scale in 1742. The boiling point was marked 0° and the freezing point of water 100°. Linnæus introduced the mode of reckoning from 0° in melting ice to 100° in boiling water, which is now known as the centigrade, and is used universally in laboratories, and in all except English-speaking countries for every scientific purpose.

Fahrenheit's scale is convenient for meteorological work on account of its short degrees, admitting of great accuracy in reading and compactness in recording, and on account of its low zero, which makes it possible in temperate climates to dispense with negative quantities. On the other hand, the centigrade scale is on the whole so convenient, its use is so nearly universal, and the advantage of a uniform system is so great that it must ultimately be adopted for all purposes.

Air Thermometer. — Under constant pressure gases expand equally for equal increments of heat. Hence, when an air thermometer is graduated between two fixed points the graduation may be continued above and below these points in degrees of the same length; and any number of air thermometers so made will agree among themselves at every temperature. The air thermometer is the ultimate standard of reference to which all other thermometers are referred.

Alcohol Thermometer.—Alcohol, the first liquid used for thermometric purposes, possesses numerous advantages, and on account of its low freezing point it is always used for observations in polar regions. Alcohol thermometers are graduated by fixing the freezing point in melting ice and by comparison with a mercury or air thermometer at several higher and lower temperatures. The graduation of ordinary minimum alcohol thermometers used for meteorological purposes is effected by comparison with mercury standards, and their indications, so far as this source of uncertainty is concerned, may consequently be relied on.

Mercury in Glass Thermometer.—The simplest form is the *Weight Thermometer*, a large glass bulb terminating in a capillary tube, and filled with a known weight of mercury at 0° C. The weight of mercury that escapes when the apparatus is heated to 100° is determined, and the temperature of any inclosure is then ascertained by placing in it the thermometer filled at zero, and weighing the liquid that runs out. Thermometers on this principle were used by Regnault in his celebrated researches on steam.

Standard Thermometers.—The tube is sometimes made with elliptical bore to insure visibility of the mercury column, but it is usually circular in section. The internal diameter must be as nearly as possible uniform. This is tested by a preliminary calibration in which a short thread of mercury is measured in different parts of the tube. The length of stem and the range of the thermometer having been decided upon, the size of the bulb is calculated from the known expansibility of mercury and the section of the bore. The bulb is made as nearly as possible the required size, either by blowing it from the tube or preferably by forming it of a glass cylinder, and attached to the stem. The bulb is usually cylindrical in form and it must be uniform in thickness. The utmost care requires to be exercised to keep the bulb and stem dry and clean and to fill them with pure mercury recently distilled. The mercury is boiled in the thermometer for some time to drive out all traces of air and moisture, and the point of the stem is sealed off. If the thermometer is not intended to measure temperatures up to the boiling point of mercury, an expansion should be made at the top of the tube to prevent bursting from accidental overheating. The process of annealing by heating to a temperature exceeding 400° C. for some hours as originally proposed by Person, or in vapor of mercury for several days renders the thermometer much less liable to suffer change of zero by the lapse of time or by heating to any higher temperature. All instruments of precision should be treated in this way, or kept for several years after they have been filled and sealed before they are graduated.

The first fixed point on the scale is marked at the place where the mercury stands when the thermometer is buried in melting ice from which the water is allowed to drain away, the second at the place where the mercury stands when the thermometer is immersed in steam of water boiling freely under the pressure of 760 mm. (29.92 inches) of mercury corrected to 0° C. The space between these may be graduated either in arbitrary equidistant divisions, as it is best to do in delicate instruments, or in degrees of any scale. Each degree centigrade is $\frac{1}{100}$ of the volume of the tube between the freezing and boiling points; if the tube is quite uniform in bore the degrees will be of equal length and may be marked off correctly by a dividing engine. If the preliminary calibration showed the tube to vary in diameter, the degree marks are often adjusted to correspond to intervals of equal volume. It is better in all cases, whether degrees or arbitrary divisions are adopted, to have them of equal length and correct the readings by the calibration curve. The scale may be continued above and beneath the fixed points in degrees or divisions of the same length.

THERMOMETERS EMPLOYED FOR SPECIAL PURPOSES.—*Physical and Chemical Work.*—For all purposes of minute accuracy where thermometers are applicable standard instruments must be employed. They must be used in one position only. The stem is usually engraved with an arbitrary scale of equal divisions, the total range not exceeding 15° C., and readings are made by a cathetometer at some distance. The use of an intermediate bulb, first recommended by Person, enables the fixed points to be observed on instruments of very short range. Results of great accuracy, certainly to 0.005° C., may be obtained in this way for comparative purposes if sufficient care be taken; but the greater the sensitiveness of a thermometer the more difficult is it to obtain a series of concordant readings. Pickering uses thermometers of extreme sensitiveness, in which, by conveying the excess of mercury into an expansion at the top of the stem, he secures that the same part of the short arbitrary scale is used for every temperature that has to be measured. In physical researches thermoelectric junctions are more often used than thermometers for measuring very small differences of temperature.

For ordinary work in a chemical or physical laboratory thermometers are used which can be read easily to one-tenth of a degree centigrade, and have a range from 0° to 100°, or in some cases to 350°C. They are always either engraved on the stem or graduated on an included scale, and are not mounted on frames of any kind. It is not necessary to calibrate such thermometers; but they should be compared with a standard at several temperatures and frequently verified in melting ice and steam of boiling water.

Zincke's chemical thermometer for high temperature has a scale commencing at 100° C. In Geissler's nitrogen thermometer the range is extended by raising the boiling point of the included mercury, the upper part of the tube being filled with rarefied nitrogen.

Meteorological.—The thermometer was early applied to the study of differences of climate, and this is still one of its most important uses. The wet and dry bulb thermometers placed in the shade give the temperature and humidity of the surrounding air, but "shade" and "surrounding air" require to be defined. Shade is intended to exclude rain and prevent all radiation; and the surrounding air is that of the atmosphere in the neighborhood of the thermometer outside any shelter that may be used. The simplest way of observing is to hang up a thermometer in the shadow of some rather distant object and leave it until it acquires a steady temperature; but this method has been found impracticable and does not give very exact results.

The sling thermometer (*thermomètre fronde*), a small thermometer whirled in the air at the end of a string, is often used as a standard, and gives more correct readings than most closed screens. All open screens are untrustworthy.

Registering Thermometers.—Rutherford's maximum, invented before 1790, was an ordinary mercury thermometer placed horizontally; the column pushed before it a small steel index, which was left at the highest point reached. It is little used now. The maximum thermometers in common use for meteorological purposes are Negretti & Zambra's and Phillips'. The former is a modified outflow thermometer. It is made with a constriction in the tube near the bulb, past which the mercury easily expands, but cannot return when the temperature falls, as the column breaks at the narrowed point when the fluid in the bulb begins to contract. The thermometer acts horizontally, but Everett devised a modification which is hung bulb uppermost, and the mercury, as it passes the constriction, falls down and stands as a column in the inverted tube. The thermometer is set by swinging it.

The minimum thermometer in most frequent use is that of John Rutherford, invented in 1790. It is a spirit thermometer, preferably filled with amyl alcohol to reduce risk of distillation, in the column of which a small porcelain index is included. The instrument is hung horizontally, and, as temperature falls, the index is drawn back by the surface tension of the fluid. When temperature rises, the liquid flows past the index easily, leaving it at the lowest point attained.

Radiation Thermometers.—The intensity of solar radiation is measured by the pyrheliometer, which usually consists of a body heated by the sun's rays and a thermometer to measure the rise of temperature. In meteorology radiation is measured by thermometers simply exposed with blackened bulbs. Results of the utmost diversity are given by different methods. As there is no means of determining the true measure of radiation, all that can be done is to have the instruments whose indications are to be compared constructed and exposed in the same way. The usual form, as suggested by Herschel, is a maximum thermometer with a spherical bulb half an inch in diameter coated with lampblack and placed in the center of a spherical vessel of clear glass, two and one-half inches in diameter, and exhausted of air. The state of the vacuum may be shown by including a small mercurial manometer, or a radiometer, or by soldering in platinum electrodes through which a discharge can be made in the interior. It is not essential that the vacuum be very perfect; some observers prefer to employ a globe filled with dry air.

Minimum radiation thermometers, intended to measure radiation from the earth at night, are usually filled with alcohol, and much ingenuity has been expended on increasing their delicacy. The bulbs are made very large relatively to the bore, and constructed so as to expose a great surface, the reservoir being often helical, lenticular, annular, spoon-shaped, forked, or even like a gridiron.

Earth Thermometers.—Saussure introduced the use of sluggish thermometers packed in non-conducting material for taking the temperature of the soil at different depths. Symon's earth thermometer on this principle is a slow-action instrument cased in felt, and is lowered by a chain into an iron tube which has previously been sunk to the required depth. It may be withdrawn and read without changing its record.

Deep-Sea Thermometers.—The earliest observations of warmth beneath the surface were made by raising samples of water in a valved box and noting the temperature when it was brought on board. Saussure, in addition to this, used sluggish thermometers, which he left immersed for several hours before reading. His latest thermometer for sea-work was filled with alcohol, and had a bulb more than an inch in diameter, which was imbedded in a mass of wax and inclosed in a stout wooden case. It attained the temperature of its surroundings very slowly, preserved it for a long time, and gave, in his hands, thoroughly trustworthy results. On the introduction of registering thermometers, these were used, but the unsuspected magnitude of the effect of pressure at great depths made the earlier records entirely misleading.

A modification of Sixe's thermometer, protected from pressure by the addition of an outer bulb partially filled with a liquid, is now usually employed on deep-sea expeditions.

Hypsometer.—The boiling-point thermometer or hypsometer may be used to obtain an independent measure of the pressure of the atmosphere, and so to determine an altitude or verify an aneroid barometer. It consists of a very delicate mercury thermometer graduated only for 20° or 25° Fahr. in the neighborhood of the boiling point of water and divided on the stem into tenths. A large aneurism on the tube a little above the bulb should allow the freezing point to be verified from time to time on the portion of stem beneath it. The thermometer is hung in a cylindrical tin vessel in which water is boiled by a spirit lamp placed underneath. The bulb must be raised considerably above the level of the water, and the whole stem to the top of the mercury column immersed in the steam. After steam has been escaping freely for some time the temperature is read, and by reference to a table the barometric pressure, and consequently the altitude, is obtained.

Clinical Thermometers.—The first use to which these thermometers were applied was the study of the temperature of the blood in fevers; and the constancy of the temperature of the healthy human body was for a century considered sufficient to entitle it to the position of a fixed point in graduating thermometers. The increased importance now attached to temperature in disease has led to the production of many forms of clinical thermometer. The large instruments intended to be read *in situ* are now entirely superseded by small maximum self-registering thermometers. Graduation is carried to one-fifth of a degree, and the usual range is about 25° Fahr.—from 85° or 90° to 110° or 115°. Olive-shaped bulbs have been used, but a cylindrical form is most common. There should be an arrangement like that suggested for hypsometers to enable the freezing point to be verified. Casella's thermometer on Phillips' system has a small expansion on the stem, followed by a contraction, to prevent the index following the rest of the mercury into the bulb when the instrument is not in use. The "half-minute thermometer" is quick in action; it has a bulb of very small diameter and an extremely fine bore, the mercury thread being rendered visible by Hicks' arrangement of a lens-fronted stem. Immisch's avitreous thermometer is recommended for clinical use on account of its small size, convenient shape, and non-liability to get out of order.

Thermometers for Technical Purposes.—These are made in an infinite variety of forms, adapted to the various processes of manufacture and industry. The scale is often dispensed with in these instruments, a movable pointer being fixed at the point at which the mercury is to be kept. Air or steam thermometers are rapidly superseding mercury instruments for all temperatures above the boiling point of water.

Metallic Thermometers.—Thermometers depending on change in length or form of composite metal bars, such as Crighton's zinc-iron bar and Bréguet's silver-gold-platinum spiral, are converted into registering instruments by the addition of two light pointers pushed forward by the index needle as it travels round the graduated arc to either side and left at their extreme points. Jürgensen, in 1841, constructed a chronometer, the balance wheel of which was arranged so as to exaggerate the effects of change of temperature and thus to affect the rate. It furnished a very close approximation to the mean temperature between the intervals of rating, and was approved by Arago for use in observations. Hermann and Pfister's metallic thermometer is probably the best adapted for meteorological purposes, and has given satisfactory results at the Zurich observatory. It is a flat spiral of brass and steel, which unrolls and coils up according to changes of temperature, moving an index on a divided horizontal circle and marking the maximum and minimum by light pointers. In order to secure regular results, the instrument must be annealed by heating for some time in boiling linseed oil.

Thermographs.—The first form of thermograph, due to Wheatstone, was an electrical apparatus. It has recently been improved by Van Rysselberghe, in whose hands it has assumed the following form: The thermometer is of rather wide bore and open above. At intervals of quarter of an hour a wire is moved gradually down the tube by a clock until it touches the mercury; an electric circuit is thus completed, and causes an indentation by a diamond point which moves in the same way as the .wire down a rotating cylinder covered with thin sheet copper or zinc. The metal sheet is renewed at each revolution of the cylinder, and it is sufficient to join the indented points with a graver to have a plate from which any number of copies of the record may be printed. Cripp's thermograph records hourly on a revolving cylinder. It consists essentially of a mercury thermometer coiled into a flat spiral and suspended on a horizontal axis. Any change of temperature displaces the center of gravity of the system, and the instrument rotates through an arc, moving a pencil as it does so. A perfectly continuous record is produced by the photographic thermograph. Wet and dry bulb thermometers are so arranged that a beam of light passes through an air-speck, which separates part of the mercury thread, or through the vacant part of the tube, and falls on a rotating cylinder covered with photographic paper on which it traces the curve of temperature fluctuation. This apparatus is probably the most perfect of its kind.

THERMOPYLÆ is the name of a famous pass in the mountains of Thessaly, which won an eternal celebrity as the scene of the death of Leonidas and his 300 Spartans in their attempt to repulse the overwhelming army of the Persians in 480 B.C.

THÉROIGNE DE MÉRICOURT, ANNE JOSEPH, was born at Marcourt (from a corruption of which name she took her usual designation), a small town in Luxembourg, on the banks of the Ourthe, on August 13, 1762. She went to Paris, and, on the outbreak of the Revolution, she was surrounded by a coterie of well-known men, chief of whom were Pétion and Desmoulins. She belonged to their party to the last—became in fact the "Fury of the Gironde." On July 14, 1789, she came prominently into notice at the fall of the Bastille, and for about four years thereafter she was seen in many of the stormiest scenes of the Revolution, being known as "la belle Liégoise," and singularly attired in a riding habit, a plume in her hat, pistols in her belt, and a sword dangling by her side. She commanded in person the third corps of the so-called army of the faubourgs on June 20, 1792, and again won the gratitude of the people. She shares a heavy responsibility for her connection with the riots of August 10th. But the time came when her party was in peril at the hands of one more extreme, and she now wildly urged the mob to more moderate courses. Then the furies of the "Mountain" seized the fury of the Gironde, and they stripped her naked, and flogged her in the public garden of the Tuileries. The infamous affront drove her mad. She was removed to a private house, thence in 1800 to La Salpetrière for a month, and thence to a place of confinement called the Petites Maisons, where she remained—a raving maniac—till 1807. She was then again removed to La Salpetrière, where she died, never having recovered her reason, on June 9, 1817.

THESEUS, the great hero of Attic legend, son of Ægeus, king of Athens, and Æthra, daughter of Pittheus, king of Trœzen. Thus through his father he was descended from Erechtheus and the autochthones of Attica; through his mother he came of the Asiatic house of Pelops. Ægeus, being childless, went to Delphi to consult the god, who gave him an ambiguous answer. He went to Trœzen, and told the oracle to Pittheus, who, seeing its bearing, contrived that Ægeus should have intercourse with his daughter Æthra. Ægeus then departed to Athens, and in due time Æthra, who remained at Trœzen, brought forth Theseus. It was given out that the child's father was Poseidon, the great god of Trœzen, and in after ages the Trœzenians pointed to the Holy Isle as the place where Poseidon and Æthra met, and where Æthra raised a temple to Athene Apaturia, at which Trœzenian maids dedicated their girdles before marriage. For his tutor and guardian young Theseus had one Cannidas, to whom, down to Plutarch's time, the Athenians were wont to sacrifice a black ram on the eve of the festival of Theseus. On passing out of boyhood, Theseus, in accordance with custom, went to Delphi, and there cut off his front hair. Ægeus had deposited his sword and boots under a heavy rock, telling Æthra that, if she gave birth to a son who, on attaining manhood, should be able to lift the rock and remove the sword and boots, she was to send him with all secrecy to his father at Athens. Theseus now lifted the rock, removed the sword and boots, and set out for Athens. He encountered many adventures on the way. First he met Periphetes, surnamed Corynetes (Clubman). Him Theseus slew, and carried off his club. At the isthmus of Corinth dwelt Sinis, called the Pine-Bender, because he killed his victims by fastening them to the top of a pine-tree (or two pine-trees), which he had bent down and then suffered to fly up. Theseus hoisted the Pine-Bender on his own pine-tree. Now, the deceased Pine-Bender had a pretty daughter, who ran and hid herself in a thicket where asparagus grew plentifully; and, when Theseus came to look for her, she prayed to the asparagus, and promised that if it would hide her, she would never injure asparagus any more. Theseus wiled her from the thicket, and from their union sprang the family of the Ioxids, who worshiped asparagus. Next Theseus dispatched the Crommyonian sow (or boar), a dreadful monster. Then he flung over the cliff the wicked Sciron, who, while his guests were perforce washing his feet, used to kick them over into the sea. In Eleusis Theseus wrestled with and killed Cercyon. A little farther on he slew Procrustes, who had only one bed for all comers; if his guest was too short for the bed, he stretched him out; if he was too long, he cut him down to the requisite length. At the Cephissus Theseus was met by the Phytalid family, who purified him from the taint of bloodshed. As he passed through the streets of Athens, his curls and long garment reaching to his ankles, drew on him the derision of some masons, who were putting on the roof of the new temple of Apollo Delphinius: "Why," they asked, "was such a pretty girl out alone?" In reply, Theseus took the bullocks out of their cart and flung them higher than the roof of the temple. He found his father married to Medea, who had fled from Corinth. Being a witch, she knew Theseus before his father did, and tried to persuade Ægeus to poison his son; but Ægeus at last recognized him by his sword, and took him to his arms. Theseus was now declared heir to the throne, and the Pallantids, who had hoped to succeed to the childless king, conspired against Theseus, but he crushed the conspiracy. He then attacked the flame spitting bull of Marathon and brought it alive to Athens, where he sacrificed it to Apollo Delphinius. Now comes the adventure of the Cretan Minotaur (see MINOS), whom Theseus slew by the aid of ARIADNE, (*q.v.*) While Theseus was in Crete, Minos, wishing to see whether Theseus was really the son of Poseidon, flung his ring into the sea. Theseus dived and brought it up, together with a golden crown, the gift of Amphitrite. On the return voyage the ship touched at Naxos, and there Theseus abandoned Ariadne. He landed also at Delos, and there he and the youths danced the crane dance, the complicated movements of which were meant to imitate the windings of the Labyrinth. In historical times this dance was still danced by the Delians round the horned altar—an altar entirely composed of left-sided horns. Theseus had promised Ægeus that, if he returned successful, the black sail with which the fatal ship always put to sea should be exchanged for a white one. But he forgot his promise; and, when from the Acropolis at Athens Ægeus descried the black sail out at sea, he flung himself from the rock, and died. Hence at the festival which commemorated the return of Theseus there was always weeping and lamentation. Theseus now carried out a political revolution in Attica by abolishing the semi-independent powers of the separate townships and concentrating those powers at Athens, and he instituted the festival of the Panathenæa, as a symbol of the unity of the Attic race. Further, according to a democratic tradition, he abolished the monarchy, and substituted in its place a popular government. These are but a small portion of the heroic actions ascribed to him, but space forbids more. His chief festival was on the 8th of the month Pyanepsion (October 21st), but the 8th day of every month was also sacred to him.

THESMOPHORIA, an ancient Greek festival, celebrated by women only in honor of Demeter Θεσμοφόρος. At Athens, Abdera, and perhaps Sparta, it lasted three days. At Athens the festival took place on the 11th, 12th and 13th of the month Pyanepsion (October 24th, 25th, and 26th), the first day being called Anodos (ascent), or, according to others, Kathodas (descent), the second Nesteia (fast), and the third Kalligeneia (fair-born). If to these days we add the Thesmophoria, which were celebrated on the 10th at Halimus, a township on the coast near Athens, the festival lasted four days. If further we add the festival of the Stenia, which took place on the 9th, the whole festival lasted five days.

THESPIÆ, an ancient Greek city of Bœotia. It stood on level ground commanded by the low range of hills which runs eastward from the foot of Mount Helicon to Thebes. In the Persian invasion the Thespian contingent of 700 men voluntarily stayed with the Spartans at Thermopylæ, and shared their fate. For its resistance to the Persians, the city was burned by Xerxes, (480 B.C.) Nevertheless in the next year, 1,800 Thespians shared in the great victory of Platæa. At the battle of Delium (424) the flower of the Thespians fell fighting against Athens on the side of Thebes, and in the following year the jealous Thebans availed themselves of the weakness of their gallant confederate to pull down the walls of Thespiæ. The walls were restored by the Spartans under Agesilaus in 378, but were again destroyed by the Thebans, apparently before the battle of Leuctra (371). After the battle the Thespians, who had taken no part in it, withdrew to a strong place, Ceressus, from which, however, they were expelled by the Thebans. In 343 the city was not yet restored; but it must have been subsequently, for it is mentioned in the Roman wars.

THESSALONIANS, Epistles to the. Thessalonica, now Salonica (*q.v.*), was in the time of the Romans the most important town of Macedonia. Here, as in Corinth, the conditions were favorable for the reception of Christianity. The population was not purely Greek, but cosmopolitan, a mixture of divers nationalities. Such a population is always more susceptible to religious novelties for good and for evil than one of old, firmly established national growth. The apostle Paul experienced this to his great joy and satisfaction here also, as he for the first time set foot on the shores of Europe with the message of Jesus Christ. It was about the year 52 or 53 that he, on his arrival from Philippi, preached the gospel of Christ in the rich merchant city.

Paul's stay in Thessalonica was short. The plots of the Jews soon obliged him to leave the town, and he betook himself to Berœa (Acts xvii. 10), thence to Athens (Acts xvii. 15), and finally to Corinth (Acts xviii. 1). The two epistles were written to the church of Thessalonica during a stay of a year and a half in Corinth (Acts xviii. 11), about 53–54, not before this in Athens, as is asserted in the subscription of both epistles in the Codex Alexandrinus and other MSS.

The first epistle gives us a very clear picture of the disposition and state of such a young church, composed of former heathens. They had received with enthusiasm the gospel of Jesus Christ, the Bringer of salvation, the Saviour in the approaching day of judgment (i. 9, 10). But the realization of this salvation was now awaited with impatience, and a sense of disappointment was experienced because some members of the church had died without having seen the advent of the Lord (iv. 13). At the same time many there were still living in gross heathen sins and vices (iv. 1–8). Paul had sent back Timotheus from Athens to Thessalonica in order to advise the young, inexperienced church, and to obtain news concerning it (iii. 1–5). He had just returned to Paul (iii. 6), and the information received through this source was the occasion of the first epistle, designed to supply the place of Paul's personal presence and bring new exhortation and instruction from the apostle to the young church, which still much needed guidance.

We have no information concerning the effect of this letter. It is conceivable, however, that the church required yet further advice and direction from the apostle, and so far it is not remarkable that Paul saw the need for a second and similar letter of teaching and exhortation. This second epistle also, if it is genuine, was written during Paul's stay of a year and a half at Corinth, very soon after the first. For it also is written in the conjoined names of Silvanus and Timotheus, who were still with Paul, while we must understand from Acts xviii. 18, that after Paul's departure from Corinth they ceased to be his companions. The occasion of this epistle seems especially to have arisen from the circumstance that the church had been put into fear and anxiety about the advent of Christ, perhaps by a pretended letter from Paul. Two passages point to the existence of such a thing: in ii. 2, Paul says that the church shall not let itself be alarmed "by word or by letter as from us" (*i.e.*, nominally coming from us), and in iii. 17 again Paul lays emphasis on his signature by his own hand as the token (of genuineness) to be noticed in each letter. In any case the chief aim of the epistle is to tranquillize the church concerning the advent of Christ, which is not yet immediately imminent. He particularly exhorts them not to let themselves be shaken in mind, as that the day of Christ is at hand (ii. 1, 2). For before this day comes the "man of sin" must first appear, who seats himself in the temple of God, and gives himself out for God (ii. 3–5). And he, too, is for the present kept back by another power (ii. 6, 7). Only when the latter is taken out of the way shall "that wicked" be revealed, and the great falling away shall follow (ii. 8–12).

The genuineness of both epistles has been questioned and the evidence seems against the second.

THESSALONICA. See Salonica.

THESSALY is the district of northern Greece which intervenes between Macedonia and the more purely Hellenic countries toward the south, and between the upland region of Epirus and the Ægean Sea. It forms an irregular square, extending for about sixty miles in each direction, and this area, which is for the most part level, is inclosed by well-marked boundaries—by the Cambunian Mountains on the north, and by Othrys on the south, while on its western side runs the massive chain of Pindus, which is the backbone of this part of Greece, and toward the east Ossa and Pelion stand in a continuous line; at the northeastern angle Olympus rises, and is the keystone of the whole mountain system.

The history of Thessaly is closely connected with its geography. The fertility of the land offered a temptation to invaders, and was thus the primary cause of the early migrations. It was this motive which first induced the Thessalians to leave their home in Epirus and descend into this district, and from this movement arose the expulsion of the Bœotians from Arne, and their settlement in the country subsequently called Bœotia; while another wave of the same tide drove the Dorians also southward, whose migrations changed the face of the Peloponnese. Again, this rich soil was the natural home of a powerful aristocracy, such as the families of the Aleuadæ of Larissa and the Scopadæ of Crannon; and the absence of elevated positions was unfavorable to the foundation of numerous cities, which might have fostered the spirit of freedom and democracy. The plains, also, were suited to the breeding of horses, and consequently the force in which the Thessalian nation was strong was cavalry, a kind of troops which has usually been associated with oligarchy. The wealth and the semi-Hellenic character of the people—for in race, as in geographical position, the Thessalians held an intermediate place between the non-Hellenic Macedonians and the Greeks of pure blood—caused them to be wanting in patriotism, so that at the time of the Persian wars we find the Aleuadæ making common cause with the enemies of Greece. When they were united they were a formidable power, but, like other half-organized communities, they seldom combined for long together, and consequently they influenced but little the fortunes of the Greeks.

For several centuries during the Middle Ages Roumanian immigrants formed so large a part of the population of Thessaly that that district was called by the Byzantine writers Great Walachia (*Μεγάλη Βλαχία*): the Jewish traveler, Benjamin of Tudela, who passed through the country in the latter half of the twelfth century, describes them as then occupying it. At the present day only a few colonies of that race remain, the principal of which are found on the western side of Olympus and in some of the gorges of Pindus. The Turkish inhabitants are settled in the larger towns, and here and there in the country districts, the most important colony being those called Koniarates, who were brought from Konieh in Asia Minor shortly before the taking of Constantinople, and planted under the southwest angle of Olympus. The Greeks, however, form the vast majority of the population, so much so that, even while the country belonged to the Ottomans, Greek was employed as the official language. In accordance with the provisions of the Berlin treaty, Thessaly was ceded to the Greeks by the Porte in 1881, and since that period it has formed a portion of the Hellenic kingdom.

THETFORD, an ancient borough and market-town, partly in Norfolk and partly in Suffolk, is situated on the Thet and Little Ouse, and on the Great Eastern railway line between Cambridge and Norwich, thirty-six miles southwest of Norwich, twelve north of Bury St. Edmunds, to which there is a branch line, and ninety-six north-northeast of London. Brewing and tanning are carried on; and there are also manure and chemical works, brick and lime kilns, flour-mills, and agricultural implements works. The Little Ouse is navigable from Lynn for barges. The population of the municipal borough (area 7,296 acres) in 1871 was 4,166 and in 1881 it was 4,032.

THETIS, a goddess, the daughter of Nereus and Doris, was married against her will to Peleus, by whom she became the mother of Achilles. She dwelt in the depths of the sea with her father, and like Proteus, had the power of changing her shape.

THEVENOT, Jean de, an eminent Oriental traveler, was a native of Paris, born in 1633, where he received his education in the college of Navarre. The perusal of works of travel moved him to go abroad, and his circumstances permitted him to please himself. Leaving France in 1652, he first visited England, Holland, Germany, and Italy. He was a year in Egypt, then visited Sinai, and, returning to Cairo, joined the Lent pilgrim caravan to Jerusalem. He visited the chief places of pilgrimage in Palestine, and, after being twice taken by corsairs, got back to Damietta by sea. In January, 1659, he sailed from Alexandria in an English ship, taking Goletta and Tunis on the way, and, after a sharp engagement with Spanish corsairs, one of which fell a prize to the English merchantman, reached Leghorn on April 12th. He now spent four years at home in studies useful to a traveler, and in November, 1663, again sailed for the East, calling at Alexandria and landing at Sidon, whence he proceeded by land to Damascus, Aleppo, and then through Mesopotamia to Mosul, Bagdad, and Mendeli. Here he entered Persia (August 27, 1664); proceeding by Kirmanshahan and Hamadan to Ispahan, where he spent five months (October, 1664–February, 1665), and then, joining company with the merchant Tavernier (*q.v.*), proceeded by Shiraz and Lar to Bender-Abbas, in the hope of finding a passage to India. He passed the summer of 1667 at Ispahan, disabled by an accidental pistol shot, and in October started for Tebriz, but died on the way at Miyana (November 28, 1667).

THIAN-SHAN, or Celestial Mountains. See Asia, Syr-Daria, and Turkestan.

THIBAUT, Anton Friedrich Justus, one of the greatest of German jurists, was born at Hameln, in Hanover, January 4, 1774, and in 1792 went to Göttingen to study. In 1798 he was appointed extraordinary professor of civil law at Kiel, and in the same year appeared his *Versuche über einzelne Theile der Theorie des Rechts* (Kiel, 1798). In 1799 he was made ordinary professor of civil law. In that year was published his *Theorie der logischen Auslegung des römischen Rechts*, one of his most remarkable works. In 1802 he published a short criticism of Feuerbach's theory of criminal law. The same year appeared Thibaut's essay *Ueber Besitz und Verjährung*. In 1803 Thibaut was called to Jena, where he spent three years, made happier than they otherwise would have been by intercourse with Goethe and Schiller. He went to Heidelberg to fill the chair of civil law and to assist in organizing the university; and he never quitted that town, though he received in after years, as his fame grew, invitations to Göttingen, Munich, and Leipsic. In 1814 appeared his *Civilistische Abhandlungen*. In 1825 appeared anonymously his work *Ueber die Reinheit der Tonkunst*. In 1836 Thibaut published his *Erörterungen des römischen Rechts*. One of his last works was a contribution, in 1838, to the *Archiv für die civilistische Praxis*, of which he was one of the editors. He died peacefully, full of years and honor, on the 29th of March, 1840.

THIBET. See Tibet.

THIELT, a town of Belgium, in the province of West Flanders, fifteen miles south-southeast of Bruges. It manufactures linen and woolen goods, gloves, vinegar and spirits, and has tanneries and bleacheries. There is also some trade in cattle and grain. The town was of considerable importance in the Middle Ages, but was almost entirely destroyed by fire in 1383, a calamity from which it never wholly recovered. The population in 1889 was 10,527.

THIERRY, the name of two excellent French historians, brothers (Augustin and Amédée), both of whom, though their literary and historical faculty was not quite equal, displayed the same devotion to historical study.

I. Jacques Nicolas Augustin Thierry, the elder and most gifted, was born at Blois on May 10, 1795. He had no advantages of birth or fortune, but was greatly distinguished at the Blois grammar school. In 1825 he published his *History of the Norman Conquest of England*, much altered and improved in the later edition of 1840. Two years later he published important *Lettres sur l'Histoire de France*, attacking the traditional method of history-writing, and recommending recourse to the original documents. By 1830 he had lost his sight. His marriage, however, with Julie de Quérengal, a woman of ability, considerably lightened his misfortune, and about the same time he was elected to the Académie des Inscriptions. He continued to pursue his historical studies, now through other eyes, and in 1834 published *Dix Ans d'Études Historiques*, which was followed by his capital work, the *Récits Merovingiens*, in 1840. His latter years were chiefly occupied in the study of the history of the Tiers État, which bore fruit in more than one publication. He died at Paris on May 22, 1856.

II. Amédée Simon Dominique Thierry was the younger brother of Augustin, and was born on August 2, 1797. He began life as a journalist. His first book was a brief history of Guienne in 1825, and three years later appeared the *Histoire des Gaulois*, which was received with much favor. The chief of his works were the *Histoire d'Attila* (1856), frequently reprinted, the *Histoire de la Gaule sous l'Administration Romaine* (1840–2), a *Tableau de l'Empire Romain*, and, in imitation of his brother, certain *Récits* of Roman history, a book on St. Jerome in 1867, and one on *Chrysostom and Eudoxia* in 1873. He died March 27, 1873.

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